TEACHER'S GUIDE
TO
SCIENCE IS DOING

Class 4

EXPERIMENTAL EDITION

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

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Foreword

This text guide and practical handbook is to accompany the science textbook for Class IV, titled 'Science is Doing'.

The purpose of this guide book is to imbibe in the teacher the new spirit of science teaching. It gives suggestions for lesson planning and the handling of children's activities in the classroom and outside to give the children every opportunity to find answers to the questions by investigating and experimenting.

The guide contains detailed information about the contents of each chapter in the textbook dealing with the children's previous experience, the treatment of major ideas, children's activities and their aims. Information is given about equipment needed for various activities. A list of questions for the children is given and their probable answers. The answers to the questions given in the textbook are also included.

The Council wishes to acknowledge the assistance given by the team of writers, Dr. B. D. Atreya, Mr. H.L. Sharma and Miss S. Mazumdar; and the reviewers, Dr. M. C. Pant and Mr. N. K. Sanyal. Special credits are due to the UNESCO-UNICEF expert Mr. A. W. Torrie for his constant and untiring assistance in guiding the writing of the book and its editing, and to Shri Enver Ahmed for the illustrations

Suggestions for improvement of this volume would be most welcome.

S.V C. AIYA

Director

National Council of Educational Research and Training

New Delhi
September 1971

Contents

Lesson Planning

The most effective teacher is the one who plans his lesson carefully every day. This is most important in the teaching of science in primary school classrooms In science the teacher should think of the equipment which will be needed and the experiences which the children will gain.

To be effective all lessons need to have some kind of structure.

LESSON STRUCTURE

An important part of lesson planning is the actual structure of the lesson. To be effective, science lessons, should always be structured and, where possible, should include child activity. There are many ways of giving structure to a lesson, but the basic concepts of all such structures are similar and are enumerated below :

1 Revision of previous work
2. Introduction of new work
3 Children's activities
and/or
Teacher demonstration
4. Teaching of new concepts
5. Recapitulation
6. Recording
7. Integration

1. Revision of Previous Work

The teacher should briefly revise the concepts or ideas studied in the previous lesson or lessons and should link them with the introduction to new learning. For example, if the previous lesson had been about the moon and the earth, and the new lesson is to be on gravitational force, then the revision should be aimed at encouraging the children to wonder why the moon orbits the earth.

Remember that the idea behind revision is to link the children's past experience with the new, so as to establish continuity in the subject. Even where the new material is quite different, some brief revision is always useful.

2. Introduction to New Work

The introduction should be aimed at stimulating the children's interest in such a way that it will be easy to introduce new ideas There are many different ways of stimulating children's interest and some of them are given below :

(*a*) A teacher may read an historical account of some science discovery which is associated with the new ideas For example, if the subject for the day is gravitation then an account of the traditional discovery of gravitation by Sir Isaac Newton would be quite a good way of introducing the lesson.

(*b*) A second way of introducing the lesson on gravitation would be through a demonstration of some kind. The teacher could deliberately drop an object such as a piece of wood on the floor -something which will make a loud noise and attract the children's attention. The teacher should then ask the question, 'Why did the wood fall ?' This may lead to class discussion and then on to a lesson about gravity.

(*c*) Use of the blackboard is a good way of leading into the subject to gravity The teacher may draw a globe-shaped earth with seas and clouds enveloping it. He may then ask 'How do the clouds, water and unattached objects like rocks, stones, animals and people stay on earth ?' The following discussion may lead on to a lesson about gravity.

(*d*) The children may be asked to conduct a small experiment for themselves by holding a pencil or a book above the desk and letting it fall. 'Why does it fall ?'

This can also lead into a discussion on gravity and thence on to the lesson proper.

(*e*) Another interesting method of introduction is to do something quite startling and arresting. In introducing the same subject of gravity a magnet may be forced inside a plastic ball and the opening re-sealed The teacher or a child from the class may then attach metal objects to the ball This will simulate the gravitational pull of the earth and the children will get a very good idea or concept of how it works

(*f*) Another form of introduction to the subject of gravity, would be to read an account of an air crash where the aircraft's engines have failed and the crash has occurred under the influence of gravity. The children should be encouraged to discuss and find out the reasons why the aircraft fell.

The enthusiastic teacher will be able to find many more interesting ways of gaining their pupils' attention, through an interesting introduction

3. Children's Activities

One of the most effective ways of presenting new material to children is through their own activities. The pupils should be encouraged to conduct simple experiments or investigations for themselves For example, in learning about the relationship between gravity and weight, the pupils should be given an opportunity of weighing things for themselves. This discovery experience is a most important aspect of modern science education. According to Bruner, a well-known educational psychologist from Harvard University in the U S A., the act of discovery has four important effects on the child

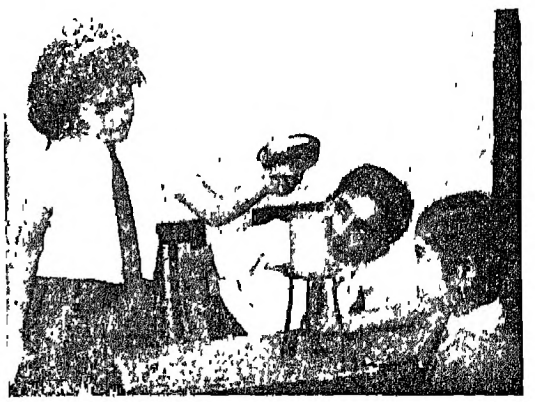
(*i*) It increases the ability of the child to use his intellect.

(*ii*) It gives him a feeling of self satisfaction in having found out something for himself. There is a shift from his need for external praise for work well done to internal self-satisfaction of knowing that he has done something interesting and instructive for himself

(*iii*) It teaches the child the 'processes' of scientific investigation.

(*iv*) Discovery methods are an excellent aid to memory. A child is more apt to remember something that he has done for himself than something which has been done for him or which he has merely read in a book.

The children's own science activities should be carefully guided The textbook



One of the most effective ways of presenting new material to children is through their own activities.

may act in part as a guide, but the teacher should also write directions on the blackboard for group or individual activities. He should also include a number of questions aimed at stimulating the pupils' curiosity and directing their observations. They should have to find out the answers to these questions themselves by carefully observing their experimental work

Teacher Demonstration

On a number of occasions, where there is limited equipment or it is difficult for the children to conduct the experiment themselves, the teacher should demonstrate to the class He should always remember that the best kind of demonstration is one that utilises large objects that the children can easily see. If the activity he is demonstrating needs close observation then the class should be gathered in a semi-circle around the demonstration table, small children in front, tall ones behind. And a word to the wise, the troublesome ones should be right at his elbow.

To get the most out of demonstration activities, the children need to be involved. Prior to the demonstration, a list of questions should be put on the board and at each point in the demonstration, the teacher should refer to the relevant question, and ask the children to supply the answers.

4. Teaching of New Concepts

The teacher should have the new concept that is the basis of the day's lesson firmly fixed in his mind. Ideally, activities should be aimed at developing this concept in the pupil's mind. After the activities have been completed they should be linked with the concept they illustrate during class discussion. If the concept is about the weight of objects, then the teacher should make certain that the children understand that weight is caused by the effect of gravity on the object

Before commencing the lesson, the teacher should have an outline plan of how he is going to present this new concept. He should know what important points should be discussed and which ones should be written on the board.

5. Recapitulation

The teacher should briefly recapitulate, *i e.*, go over the whole lesson after it has been taken. This will enable the children to methodically review what they have just learned and should give them an opportunity to ask questions about things they have not understood.

6. Recording

Prior to the lesson, the teacher should have firmly fixed in his mind, the kind of

The children may keep their records in individual science books.

record he requires of the children for this lesson. Records are kept in order that the children may refresh their memories from time to time. At the primary school level many kinds of records may be kept.

(*a*) *Individual book records.* The children may keep their records in individual science books. The record should be quite simple, stating :

(*i*) What we did.

(*ii*) What we found out.

(*iii*) Class notes and conclusions.

Some headmasters or for that matter individual teachers would prefer a more formal way of detailing the record, but for 8--year olds a brief outline of the lesson is quite adequate.

(*b*) *Posters.* Groups may record their activity in the form of a poster This is where the artist and recorder would have an opportunity of showing their abilities. Further, this is where science may be integrated with art and the science lesson may conveniently be followed by an art lesson, during which time the posters are made.

(*c*) *Murals.* Groups may work together to produce a painted mural for the wall Each group should be allocated a certain section of the mural which is then painted on separate pieces of paper which are glued together at the end of the work.

(*d*) *Scrap books.* Each group may keep its own record in a scrap book. Pictures may be cut and pasted into the book and accompained by appropriate text.

(*e*) *Friezes.* Each group in turn could be given the responsibility for producing a small picture which can be placed above the blackboard or on the wall to form a frieze

7. Integration

An important part of modern science teaching in the primary school is integration. This includes two aspects : (*a*) The interrelating of concepts and principles within the subject, and (*b*) The interrelating or integration of subjects with one another.

(*i*) Integration within the subject increases the children's opportunity of understanding basic concepts For example, the concept of the sun's energy being used by green plants to make food, should be revised again when dealing with energy under the heading of force, work and energy.

(*ii*) An example of integration between subjects, is relating a science lesson on the spherical nature of the earth and Magellan's voyages with a social studies lesson on the voyages of famous navigators. Further, a lesson on animal sounds could be linked up with a music lesson and a lesson on growth may be linked with mathematics. In such a way the total education of a child within the classroom becomes more complete and certainly more meaningful to him.

GENERAL PREPARATION FOR THE LESSONS

An important part of lesson planning is the prior preparation that may be needed for the lesson These are briefly stated below :

1. Blackboard Preparation

It is a good idea to put the title of the

activity and questions relating to the activities on the board before the lesson This may be accompanied by brief outline diagrams of how activities should be set up.

2 Equipment

The teacher should make certain that the equipment needed for the day's activities or demonstrations is readily available and is in the classroom before the commencement of the lesson He should know how much equipment is available and how many groups can be supplied

It is a good idea to put the title of the activity and questions relating to the activity on the blackboard before the lesson.

3 Group Work

As mentioned previously the class should be divided up for group activities prior to the lesson It is a good idea to have semi-permanent groups

4 Field Work

The prior planning for field work is so important that it really needs a small handbook to itself The most important points are briefly mentioned below :

(*i*) Permission must be obtained from the headmaster to conduct such field work

(*ii*) Transport arrangements where needed, should be arranged through the headmaster well in advance of the field trip

(*iii*) The assistance of another teacher or some parents should be sought

(*iv*) The teacher should thoroughly investigate the area to be visited well ahead of the trip.

(*v*) Introductory and follow up lessons should be planned in advance

Remember that the most successful science lessons are likely to be the best prepared

CHILDREN'S EXPERIMENTAL ACTIVITIES

An experiment is an activity which the child conducts in order to solve a problem. It is not only a means to an end,

An experiment is an activity which the children conduct in order to solve a problem.

but it is also an end in itself Besides discovering the answer to his problem the child also learns a way by which this and other similar problems may be solved. We might say that the answer to the problem is the 'product' and the way of solving it is the 'process' of the experimental activity.

Let us suppose that a Class IV child wants to know if snails are sensitive to heat He will obtain a snail and carry out a number of experiments aimed at showing whether or not the snail responds to heat. If the snail is alive it will usually move away from a hot object And so the child discovers the answer to his problem. At the same time he also discovers ways and means of carrying out such an investigation. He may use these experimental methods to find out about the reactions of other animals.

Children are by nature full of curiosity and it is important that their curiosity should be encouraged rather than discouraged by their teachers. To this end, children should be allowed to discover as much scientific information as possible for themselves in the classroom.

The object of this pratical handbook is to give Class IV teachers a guide to problem solving situations in the classroom. Each activity described :

1. poses a problem ;
2. details the aim of each activity ;
3. details the equipment needed ;
4. gives the teacher directions as to how to conduct each activity ;
5. gives a series of questions and answers which will help to guide the children's thinking ;
6. where appropriate, gives extensions to the original idea.

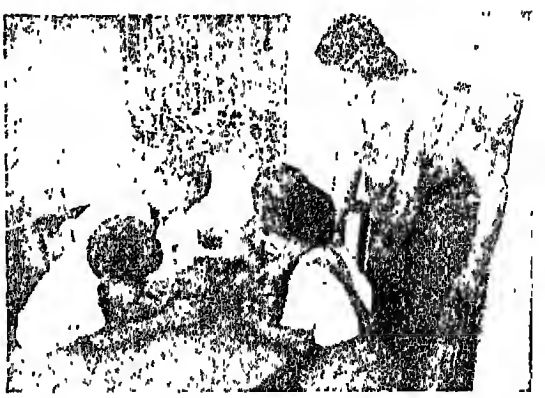
There are three principal ways by which children may discover things for themselves in the classroom.

1 By a Class Demonstration

This should be conducted by the children and the teacher but this method should be restricted to situations where there is a limited amount of equipment Where possible, the children should be made to feel that they are conducting the experiment and the teacher should act merely as a guide by remaining in the background to give assistance where needed.

2 Group Activities

This is a most effective way of enabling the children to discover things for themselves. It teaches the children the need for team work and makes the most effective use of a limited supply of equipment. For group activity work, it is a good idea to delegate individual tasks beforehand.



The group activity is one of the most effective ways of enabling children to discover things for themselves.

The class should be divided into groups of five to seven children. Each group should have a responsible leader designated by the teacher. Group responsibilities may be as under :

(*i*) *A group leader* whose responsibility is for the general supervision of group activity. He should also report group findings back to the class He should also record long term experiments, such as weather observations.

(*ii*) *A recorder*. The task of this pupil is to record the results and findings of the group after discussion between the members. He should work closely with the group leader.

(*iii*) *An artist* The artist's responsibility is to make sketches of the equipment and to record any important discoveries in a diagram form.

(*iv*) *Assistants*. The 4th and the 5th pupils should act as assistants in carrying out experimental work.

The responsibilities should be rotated within the group at intervals although the children may be quite satisfied for each group to have a permanent structure

3. Individual Activities

The third discovery method of learning is by individual activity, where the child is encouraged to work by himself. Such activity may be conducted where the equipment is simple and in adequate supply. This is a relatively important method of approach because it develops the manipulative skills which are needed by scientists and technicians as well as by people in other walks of life.

Class Organisation

Classes need to be organised carefully for effective activity learning. If you are unfamiliar with this kind of teaching situation you will have to get used to a

The noise level will be much higher as children discuss and argue among themselves.

number of different things. The first is that the noise level will be much higher as children discuss and argue among themselves The main thing here, is to make certain that the discussions are orderly and reasonable. The next point is that the amount of movement in the class must increase with activity learning. This is something that cannot be avoided.

The teacher should move about among the groups keeping a watchful eye on problem-children and generally stimulating and encouraging them to work. In this way the teacher can retain an informal control over the class. The important thing, is to remember that the teaching situation has changed from one of

direct teacher control to one of indirect teacher control. The learning conditions of these two situations are quite different. In the former, the children are passive with their attention focussed on the teacher and in the second situation the children focus their attention on one another and on their experimental work.

PREPARATION

1. *For Practical Work*

The teacher should always see that equipment is readily available in the classroom before each lesson. He may actually detail two or three monitors to help him to assemble the equipment and to give it out at the beginning of the lesson.

2. *Blackboard Work*

It may be useful to sketch an outline of the assembled equipment on the blackboard before the lesson. If the experiment is not described in the children's textbook, then it would be worth while to also include an outline description of how the children should conduct the activity. These descriptions are of course supplied in this handbook.

Questions

The object of the questions and answers in this handbook is to guide and stimulate the thinking of the children. The questions should be written on the blackboard and the children told that they have to find out the answers to these questions for themselves.

Discussion

At the end of each activity there should be a discussion period, when children can discuss the answers to the blackboard questions and also ask questions. This is the most valuable part of any lesson.

CHAPTER I

Our Universe

Children's Previous Experience

In Class 3 the children should have learned the following major ideas.

1. The earth is a big round ball.
2. The earth rotates causing day and night.
3. The appearance of the moon changes from night to night

It would be advisable to briefly revise the above major ideas before commencing this Class 4 unit.

Overview of the Unit

The knowledge of the earth as a planet will be extended in Class IV to include all the planets of the solar system.

The children will learn that all the planets including the earth, orbit round the sun.

The idea that the planets have no light or heat of their own is contrasted with the idea of heat and light being emitted by stars The textbook refers to the sun as a star. This idea may be difficult for the children to understand, because they may be unable to identify the sun as a star.

The arrangement of the stars in the form of constellations is another important idea Perhaps the children will find the term constellation too difficult If so, the word 'group' should be substituted

The scientific reasoning for the seasons has been omitted because the concept of the earth's tilted axis was thought to be too difficult. It is felt that the treatment of seasons from a scientific viewpoint, should be left to higher classes. By that time an adequate background of experience would have been built, upon which the children may base their understanding of this phenomenon.

Mention has been made of the relative positions of the mid-day sun in mid-winter and mid-summer.

Treatment of Major Ideas

1. *The earth is one of the nine planets orbiting round the sun*

This idea has been dealt with through pupil activities. The number of planets has been limited to four in the activities. The idea that the interiors of planets are hot is given by referring to hot springs and volcanoes. If the children wish to know more about the other five planets the teacher may get this information from the Teacher's Handbook Vol. I

pp 56-59 The names of these planets are : Jupiter, Saturn, Neptune, Uranus and Pluto

2. *There are crores of stars in the sky*

This idea has been merely described in the text, because the children are familiar with the fact that there are a large number of stars in the sky.

There are two activities designed to give the children an understanding of the emission of heat and light from the stars, and why stars are invisible in day time. It may be difficult for them to understand that the stars emit heat. But if the children can grasp that the sun is also a star, this idea will be much easier to understand.

The grouping of the stars into imaginary forms called constellations is also dealt with through an activity. It would be worth-while to make the children locate definite well marked constellations themselves

3 *The seasons are caused by the orbiting of the earth on its tilted axis around the sun*

This major idea may prove to be a bit too difficult. Through an activity the children are led to associate the tilting of the north pole towards the sun with summer seasons in the northern hemisphere with the help of a globe or ball and a lamp. The position of the mid-day sun in mid-summer and in mid-winter could be associated with the observations of children with their shadows in summer and winter. But this requires essentially a long term planning.

4. *Changes in seasons affect the lives of people, plants and animals*

This idea is dealt with in narrative form. The children will have adequate experience on which to base their understanding of how seasonal change affects the lives of living things

DETAILS OF PUPILS' ACTIVITIES

Activity 1

What is a planet ?

Aim of the activity

The aim is to enable the children to understand the nature of a planet and its orbit. This activity will show the children that the earth orbits around the sun.

The rope used to link the pupils, carrying out the activity, serves two purposes. It helps to trace a regular pathway

or orbit and it gives some idea of gravitation linking the earth to the sun.

Equipment

A rope or piece of string.

Directions

Ideally, a large open space is needed. The directions in the textbook are quite clear. During the activity it would be wise for the children to mark the orbit on the ground with a sharp stick. This will emphasise the regular nature of the orbit.

Suggested questions

1. Q. What is a planet ?
   A. A planet is a body that travels around the sun.
2. Q. Why is the earth a planet ?
   A. Because it orbits around the sun.
3. Q. What time does the earth take to travel around the sun ?
   A. One year or 365 days (actually it is 365·25 days, which causes a leap year, once in four years).
4. Q. How long does it take the earth to rotate on its axis ?
   A. 24 hours.
5. Q. What is the nature of the earth's pathway around the sun ?
   A. It is almost circular.

Activity 2

How do these planets orbit around the sun ?

Aim of the activity

This activity is to demonstrate that each planet has its own independent orbit around the sun. The orbits of only four planets are demonstrated so as to avoid confusion

Equipment

Rope, two sharp sticks

Directions

The teacher should see that the children trace four circles of different radii,

so that while they are playing as planets they do not collide with one another.

The relative sizes of the planets and their distance from the sun will be found

in the Teacher's Handbook p 58 Vol. 1 This information should be given to the children only if they ask.

Suggested questions

1. Q. How many planets took part in the activity ?
   A Four planets.
2. Q. Can you name these planets ?
   A. Mercury, Venus, Earth, Mars.
3. Q. How many planets are there altogether ?
   A. There are nine.
4. Q. What do we call the sun together with its planets ?
   A. The solar system.
5. Q. Why do the planets not collide with one another ?
   A. Because they have different pathways around the sun.

Extension of the ideas

1. If the children ask, you can give them the names of all the planets.
2. Children may be asked to look for the planets in the sky at night.

They may be encouraged to tell the difference between a planet and a star.

The term, planet means wanderer. Planets are seen to move or 'wander' among the stars.

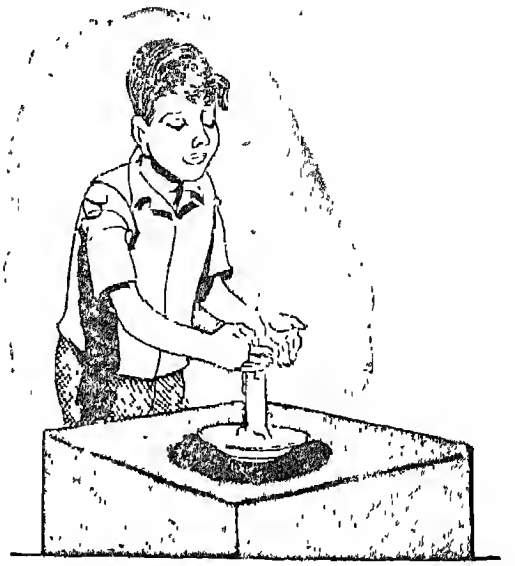
3. Names of the planets visible to the naked eye are, Mercury, Venus, Mars, Jupiter and Saturn.

Activity 3

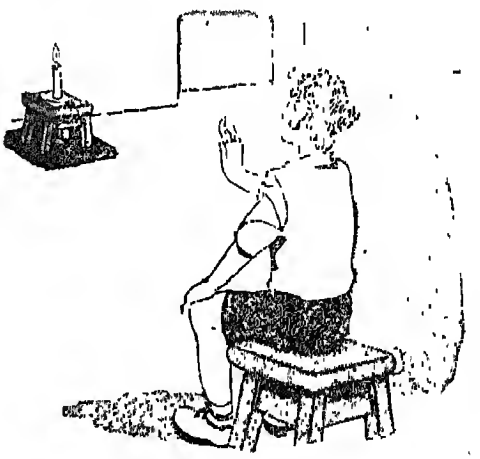
Why do the other stars not give us heat and light ?

Aim of the activity

The main aim is to show the children that the stars are too far away for their



heat to be felt. But we are able to see the faint light of individual stars.



Equipment

Candle.

Directions

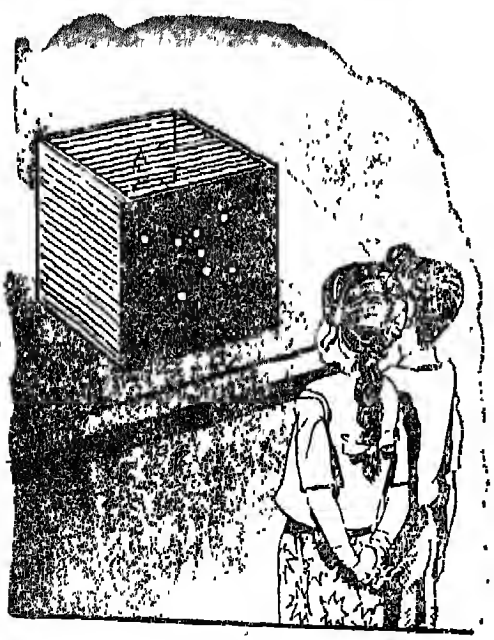
The directions are quite clear from the text.

Suggested questions

1. Q Do you feel the heat from the candle when your hands are close to it ?
   A. Yes.
2. Q. Do you feel this heat at a distance ?
   A. No.
3. Q Why don't you feel the heat ?
   A We are too far away.
4. Q. Can you see the flame at a distance ?
   A. Yes.
5. Q. How is the candle like the stars ?
   A. We can see the light of stars from a distance but not feel its heat. So is the case with a burning candle. From a distance we see it But we do not feel its heat.

Activity 4

Why are the stars not visible during the day ?



Aim of the activity

The aim is to enable the children to understand that during the day the intense light of the sun prevents us from seeing the weak light from the stars

Equipment

A piece of black or brown paper at least 50 cms square

Candle.

Box if available or an chnorah

Directions

It is possible that there will not be enough material or space for this to be a group activity. The teacher should ask a group of children to assist him and run this as a class activity

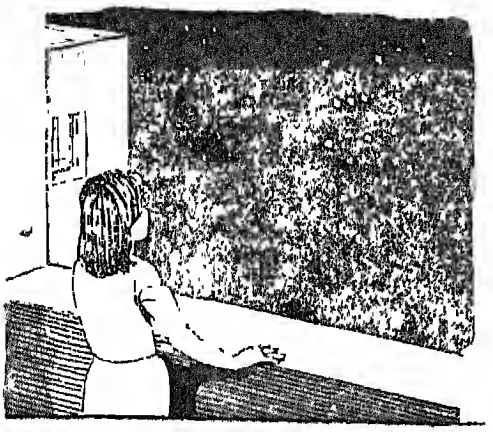
The holes should be punched in the paper according to the shape of the constellation shown in the text

Suggested questions

1. Q Could you see the stars made on the paper in the dark ?
   A. Yes.
2. Q Could you see the stars made on the paper out in the sunlight ?
   A. No
3. Q. Why can't you see the stars in the sunlight ?
   A The sun's light is stronger than the candle light.
4. Q Do the constellations change their shape from night to night ?
   A. No, they don't.
5. Q. In what direction will you find the Pole star ?
   A. North

Activity 5

What does a constellation look like ?



Aim of the activity

The aim is to develop the idea that the stars are seen grouped together in definite shapes called constellations, to which names are given according to their make-believe shapes.

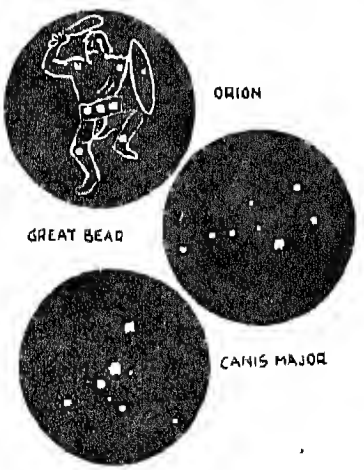
Equipment

Same as in Activity 4.

Directions

Around the shape of the constellation on the paper draw the outline of a hunter Indicate his head, shoulders, leg and belt

Let the pupils locate some constellations like the Great Bear or Cassiopoea which are found in the Northern sky in different seasons It is advisable to indicate their shapes on the blackboard and their possible location in the sky.



Suggested questions

1. Q What is a constellation ?
   A. A group of stars with a definite shape.
2. Q. What is the name of the constellation shown on the paper ?
   A Orion.
3. Q. What other constellations can you recognize ?
   A. Great Bear.

Activity 6

How are volcanoes formed ?

Aim of the activity

The aim is to make the children appreciate that the interior of the earth is very hot and rocks are formed in a molten state. These rocks are thrown out from places on the earth's surface that are weak. These places are known as volcanoes

Equipment

Plastic bag, mud, pin.

Directions

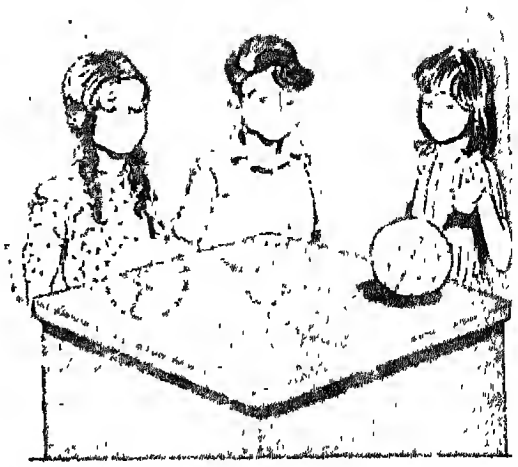
As given in the textbook.

Suggested questions

1 Q. Why does the mud not come out when pressed at first ?
A. The bag is closed from all sides and its walls are strong
2. Q. Why does the mud come out when a hole is made and the bag is pressed ?
A. On pressing the mud finds a way of escaping out of the bag.
3. Q Would the contents of the bag come out readily if they were solids ?
A. No.
4. Q. What indicates that the interior of the earth is hot ?
A. The existence of hot springs.
5. Q. Why is the interior of the earth believed to be in a molten state ?
A. Because it is hot.
6. Q. What is a volcano ?
A. It is an opening on the surface of the earth from which hot lava and gases are emitted.
7. Q. Where is a volcano found ?
A At places where earth's crust is weak.

Activity 7

How do positions of the earth change as it orbits the sun ?



Aim of the activity

The aim is to show that seasons on the earth change on account of its tilted position while orbiting the sun

Equipment

A globe or a ball and a lamp.

Directions

Place the globe (earth) or the ball and lamp (sun) in the positions suggested in the text book Keep the earth's axis vertical and by moving the globe on its orbit show that the amount of sunshine is equal in all positions on the orbit. Now tilt the axis of the earth and show that the amount of sunshine varies in different positions of the orbit. Take the north pole as a reference, and indicate in what positions one would expect summer and winter. Thus lead the children to understand that the tilting of the axis is the main cause for the occurrence of seasons.

Suggested questions

1. **Q** In what position does the northern hemisphere get more heat than the southern hemisphere ?
   A. When the north pole appears tilted towards the sun.
2. **Q** What is the position of the south pole at this position ?
   A. It is tilted away from the sun.
3. **Q.** What would be the season in the southern hemisphere at this position ?
   A. Winter.
4. **Q.** What would have happened, had the earth's axis not been tilted ?
   A There would be no change of seasons.
5. **Q.** Why would there be no change ?
   A. Because all parts of the earth would receive the same amount of sunshine throughout the year.
6. **Q.** What change in the activity of plants in different seasons have you noticed ?
   A. In summer or winter the leaves of the trees are shed but in spring and monsoon new leaves appear.

Answers to questions in the textbook

1. *a* satellite
   b. planets
   c. planet
   d orbit.
2.

Column A	Column B
(*a*)	(*d*)
(*b*)	(*c*)
(*c*)	(*b*)
(*d*)	(*a*)

3. This planet is the earth, on which we live
4. This is because planets are at different distances from the sun. The nearer a planet orbits the sun, the more energy it would receive from the sun.

Homework assistance

1. The teacher should make certain that the children have the shape of the constellation for which they are searching at night.
2. Venus can be identified as the bright evening "star" that is seen in the west. Mars is of reddish colour and may not be so easy to identify.
3. If you have a copy of the Teacher's Handbook, information may be taken from there.

CHAPTER II

Air, Water and Weather

Children's Previous Experience

The children should now know that water is constantly undergoing change. It changes readily from water to water vapour to clouds and back to water again. This is the water cycle, which the children will have learned about in Class 3.

The major ideas learned in Class 3 are as follows.

1. Water is constantly undergoing change.
2. Water exists in three states.
3. There are many types of weather.
4. The weather changes.
5. Weather influences travel, play and clothing.

Overview of the Unit

The activities point out to the children how the sun affects our weather. The effect of the sun's heat on land and water is emphasised through a number of activities.

The ideas of evaporation and condensation dealt with in Class 3 are further extended. Here the factors affecting evaporation are dealt with. Then condensation is shown as the reverse process of evaporation.

Rain water is used as an example of naturally occurring pure water. The various processes of purifying water are dealt with. The use of safe water for drinking and cooking is further emphasised Water obtained from tube wells has been regarded as normally being safe water.

Treatment of Major Ideas

1. *The sun plays an important part in causing changes in the weather*

This relationship has already been introduced in Chapter 1, Our Universe. In this unit the effect of the sun on land and water is explored through an activity.

This major idea actually runs through the whole unit and is illustrated by other activities.

2. *The change of water into water vapour is called evaporation*

The factors affecting evaporation such as the sun, wind and surface are dealt with through certain activities

3. *The change of water vapour into water is called condensation*

The process of condensation is shown

by a single activity. This has been related to rainfall and the formation of fog.

4. *Water can be purified in many ways*

The importance of safe water has again been emphasised. Activities deal with sedimentation and filtration to remove the suspended material from the water.

A descriptive passage in the text shows how water may be made completely safe for drinking by boiling or by adding chemicals The water from tube-wells has been regarded as safe water.

DETAILS OF PUPILS' ACTIVITIES

Activity 1

How does the sun affect land and water ?

Aim of the activity

This is to show that during the day the land gets heated much quicker than the water and during the night the land cools much more quickly than the water of sea, lakes, rivers and streams.

Equipment

Two wide mouthed basins,
measuring cylinder,
spring balance,
thermometer.

Directions

These are self-explanatory in the text-book.

Suggested questions

1. Q. Which gets heated quicker in the sun -sand or water ?
   A. Sand
2. Q. Which cools quicker inside the classroom—sand or water ?
   A. Sand
3. Q. What do you understand by the word temperature ?
   A. How hot or how cold a body is.
4. Q How does the sun affect the weather ?
   A. It warms the land, evaporates water and causes the water cycle.

Activity 2

What happens to water when left in a vessel for some time ?

Aim of the activity

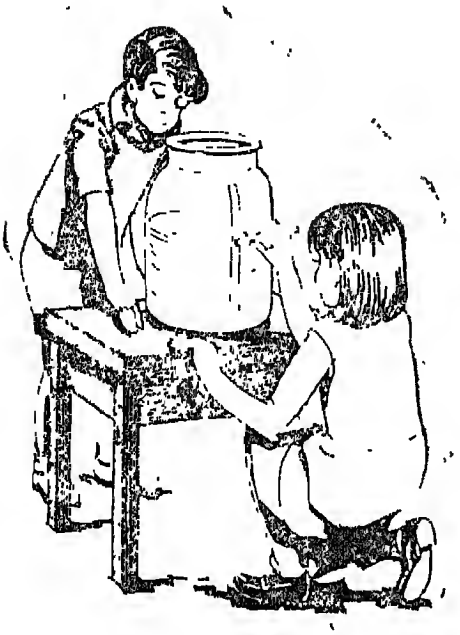
The main idea is to show that water is evaporated when exposed to the atmosphere.

Equipment

A glass jar, strip of paper, glue.

Directions

As given in the textbook. As this is a long term experiment care should be



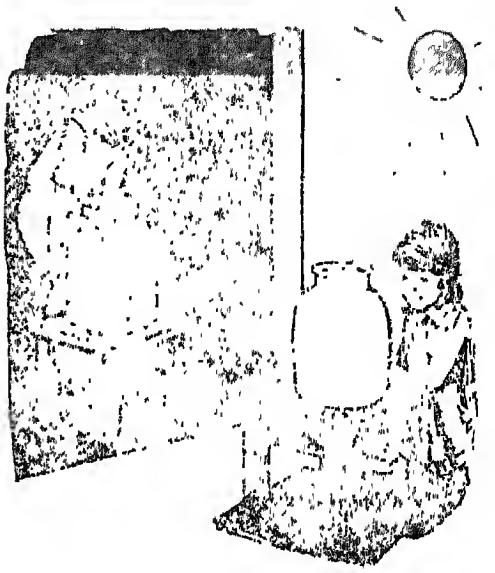
taken to see that the experiment is not disturbed.

Suggested questions

1. Q What change in the water level do you find after one day ?
   A. The level goes down. (In hot weather water may evaporate completely)
2. Q. Why does the water level change ?
   A. The water evaporates into the air
3. Q What does the water change into ?
   A It changes into water vapour.
4. Q. When do you get the water back from the water vapour of the air ?
   A. When it rains

Activity 3

Does water evaporate more rapidly in the sun or in the shade ?



Aim of the activity

The aim is to show that in the sun, water evaporates more quickly than in the shade.

Equipment

Two bowls, water

Directions

It is best to conduct this activity on a sunny day when there is no wind. The bowls should be left undistrubed until there is a distinct change in the water levels.

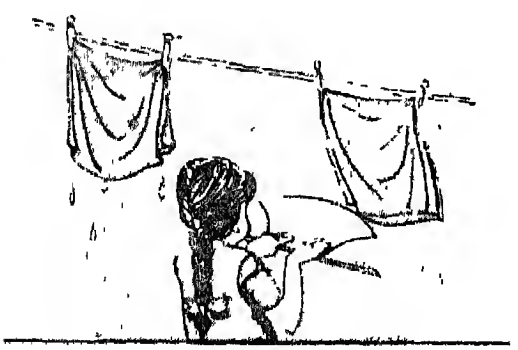
Suggested questions

1. Q. Which place is warmer—in the sun or in the shade ?
   A. In the sun.

2. Q. Which basin loses the most water ?
   A. The one in the sun.
3. Q. How does this happen ?
   A The heat of the sun evaporates the water
4. Q. Why doesn't the water in the shade evaporate as quickly.
   A. Because the temperature is lower.
5 Q Why do clothes dry faster when spread out in the sun ?
   A. Because the sun's heat evaporates the water.
6. Q. When would you expect water to evaporate more quickly ? In summer, in the rains, in winter ?
   A. In summer.

Activity 4

Does water evaporate faster on a windy day ?



Aim of the activity

This is to show that moving wind makes evaporation faster

Equipment

Two pieces of cloth of the same material and of equal size, hand fan or electric fan.

Directions

As given in the textbook Children could fan the cloth with any thick paper to speed up the evaporation.

Suggested questions

1 Q. Why should the cloths be the same size and of the same material ?
   A. So that the wet cloths will have the same amount of water present
2. Q. From which cloth does the water evaporate faster ?
   A. The one under the fan.
3 Q. Why does the water evaporate faster under the hand fan ?
   A. Because the hand fan causes a wind.
4. Q. Why do clothes dry quicker on a windy day ?
   A. Because wind brings more air in contact with the cloths.
5. Q. Why do people wave wet sarees backwards and forwards in the air ?
   A. The wind currents made by the movement dry them more quickly.

Activity 5

Does the extent of surface area affect evaporation ?

Aim of the activity

To show that the larger the surface area exposed to the air the faster the evaporation rate.

Directions

The same pieces should be used. One cloth should be folded into a very small square and the other kept flat.

Suggested questions

1 Q. Which cloth dries first ?
A. The one that is spread out.
2. Q. If both cloths are of the same size why does this happen ?
A. Because one is folded up.
3. Q. Which cloth piece has a larger area exposed to air ?
A. The one which is spread flat.
4. Q. Are the inner folds of the cloth dry ?
A. No they are damp.
5 Q. Why is the water slow to evaporate from the folded cloth ?
A. Because only a small area of the cloth is in contact with air.
6. Q. Why is the washing spread on the ground or on the line ?
A. So that the maximum area of cloth will be exposed to air.

Activity 6

What happens when water vapour is cooled ?

Aim of the activity

This reinforces the experience of condensation from Class 3.

Equipment

A kettle or pot of water.
A cold metal plate
A burner.

Directions

As given in the textbook. Care should be taken so that the children do not spill the boiling water or get their hands scalded in the steam.

Suggested questions

1 Q What do you see on the metal plate when held in the steam ?
A Drops of water.

2. Q. How did this water get on to the plate ?
   A. The steam cools and condenses into water.
3. Q. Why does the steam condense ?
   A. The metal takes heat from the steam. This causes the water vapour or steam to condense.
4. Q Where else does this happen ?
   A. When it rains, water falls from the clouds.
5. Q. What is fog ?
   A. It is a low cloud
6. Q. What is dew ?
   A Droplets of water condensing on grass or earth, etc.

Activity 7

What is safe water ?

Aim of the activity

The aim is to impress that rain water is almost pure as it has not been contaminated by anything from the ground.

Equipment

Bucket to collect rain water

Directions

This activity can be done only when it is actually raining. This may be followed by oral discussion.

Suggested questions

1 Q What is rain ?
   A. Rain is condensed water vapour falling from the clouds.
2. Q Does the water vapour in the clouds carry with it salt from the sea ?
   A. No, salt does not evaporate along with water.
3. Q Does the rain water look clean ?
   A Yes.
4. Q. Does the rain water get contaminated before it falls on the ground ?
   A. No
5 Q Why do you consider rain water safe for drinking ?
   A. Because it is pure water coming straight from the clouds

Activities 8 and 9

How do we make water safe for drinking ?

Aim of the activities

This is to let the children find out the various ways by which dirty water may be cleared.

Equipment

Two glass jars, rubber tube, flower pot, sand, piece of cloth.

Directions

As given in the text Care must be

taken to keep the rubber tube away from the bottom of the jar when water is siphoned off.

Suggested questions

1. Q. What happens to dirty water when kept for sometime ?
   A. Some sediment settles on the bottom. The top water clears.
2. Q. Would you consider this water good for drinking ?
   A No, it may still contain impurities
3. Q What happens to the dirty water when filtered in the flower pot ?
   A The sediment is trapped by the sand.
4. Q. Which method gives cleaner water ?
   A. The filter method.
5. Q What makes the well water filtered ?
   A. The earth and soil in the ground trap the solid particles.
6. Q. Is the clear water safe enough to drink ?
   A. No, it may be contaminated.
7. Q. How is water made safe to drink ?
   A. By boiling or by using chemicals.

Activity 10

How is water stored underground ?

Aim of the activity

The aim is to explain how water gets stored above non-porous underground rocks and to give an idea of water table.

Equipment

Tin can and sand.

Directions

As given in the textbook. If there is

a river nearby it can even be carried out-of-doors.

Suggested questions

1. Q. Why does the water pass through the sand layer ?
   A. Because it is porous
2. Q. Why does the deeper layer of sand look different ?
   A. It is saturated with water.
3. Q. Why does this layer contain water ?
   A. Because the base has a non-porous layer.
4. Q. Why is water found in wells only after a certain depth ?
   A. Because the porous layer of the earth allows the water to pass through.
5. Q. What will happen if the non-porous layer is very deep ?
   A The water level will also be very deep
6. Q At what level do you expect water in a well ?
   A. At the level of the water table.
7. Q How is underground water lifted to the surface ?
   A By digging wells or boring tube wells

Answers to questions in the textbook

1. (*a*) faster
   (*b*) slower
   (*c*) sun
   (*d*) evaporation
   (*e*) condensation
2.

Column A	Column B
(*a*)	(*b*)
(*b*)	(*d*)
(*c*)	(*a*)
(*d*)	(*c*)

3. Evaporation takes up heat from the skin.
4. By filtration and chemical treatment or by boiling.
5. Underground water is filtered through porous rocks and is not exposed to outside dirt.

CHAPTER III

Rocks, Soils and Minerals

Children's Previous Experience

The children already know that there are different kinds of soil. They also know that soil is formed by the weathering of rocks.

In Class 3 there was emphasis on humus that makes the soil fertile.

Overview of the Unit

In this unit the emphasis is on conservation and protection of soil. The causes of soil erosion are investigated as are also the methods of soil protection.

Conservation of soil fertility is not dealt with, because of the conflict of needs. Animal dung, grass stalks and other organic material should be returned to the soil. However, it is often burnt because of the lack of fuel. The teacher should, therefore, emphasise that organic materials are essential for the conservation of soil fertility.

Treatment of Major Ideas

1. *Soil is found in layers*

The treatment of this idea is through field activity, which may be in the school playground or in the nearby fields. The main purpose is to give the idea that top soil is essential for crops.

2. *Soil is washed away by rain and rivers*

Besides the activities, the teacher should also make good use of the children's own experience of the effect of rain and floods on soil.

3. *Soil may be blown away by wind*

The teacher may support the activity with the children's experience, particularly in places where there are dust storms Rajasthan was not a desert in ancient times It was a rich fertile area which has since been spoiled by wind erosion of the soil.

4. *Soil can be protected in many ways*

Ideas of soil protection through plant cover, terracing and bunds are introduced through activities.

DETAILS OF PUPILS' ACTIVITIES

Activity 1

What do soil layers look like ?

Aim of the activity

The aim is to let the children discover that soil is found in layers and that the fertile top soil is the layer which is important to plants and man.

Directions

The teacher should be very careful when taking the children on such a field trip He should be careful to select the right place. It is better to visit the place beforehand to make certain that the soil is suitable for digging. The soil should also show distinct layers of different colours.

The teacher should dig the hole himself so as to avoid any chance of the children being hurt. The hole should be a deep straight cut with the soil layers clearly exposed.

It may be worth while for the children to measure the thickness of each layer.

Suggested questions

1. Q. How many layers are there ?
   A. (the number should be given—usually three).
2. Q. What is the colour of each layer ?
   A. The colour will vary according to the place .
3. Q. What is the depth of each layer ?
   A (the depth should be given).
4. Q. Which layer of soil is loosely packed ?
   A. The top layer. (This is only if the area chosen has not been compacted and there is good loam soil).
5. Q What is the colour of the top soil ?
   A. (The colour should be given).
6. Q. In which layer you find roots of most plants ?
   A. The top soil.

Activity 2

How does water wash away the top soil ?

Aim of the activity

The activity is meant to demonstrate that running water washes away the soil. The teacher has however to relate the activity with the running water of heavy rains and flooding rivers

Equipment

Spade or shovel,
sand or light soil.

Directions

The teacher should do the spade work himself

A model of mountains and valleys of sand or soil should be made co-operatively by children.

Suggested questions

1. Q. What happens when you pour a bucket of water down your model river valley ?
   A. Water flows down the valley.
2. Q. Why does the water become muddy ?
   A. Because there is soil in the water.
3. Q. What happens to the soil ?
   A. It gets washed away.
4. Q. What happens to the model hills ?
   A. Part of them gets washed away by the water.
5. Q. Why is the washing away of the top soil harmful ?
   A. Because the plants grow in this soil.

Activity 3

How does wind blow away the top soil ?

Aim of the activity

This activity would help the children to find out that top soil may be easily blown by the wind.

Equipment

Sand, piece of paper, book or hand fan.

Directions

As given in the text.

Suggested questions

1. Q. What happens to the sand or soil when blown with a hand fan ?
   A. It gets blown away.
2. Q. Where does the blown soil go ?
   A. It falls elsewhere.
3. Q. In what form is it carried by the wind ?
   A. It is carried as dust.
4. Q. Why is wind erosion harmful to crops ?
   A. It blows away the fertile top soil.
5. Q. What is the difference between water erosion and wind erosion ?
   A Water washes away the minerals as well as soil.

Activity 4

How do we protect the top soil ?

Aim of the activity

This activity shows how plants such as grass prevent wind and rain from removing the top soil.

Equipment

Two empty boxes, sand, turf, water, watering can.

Directions

The children should participate in this activity. The grass should completely cover the soil in one of the boxes.

Suggested questions

1. Q. Why are the boxes tilted ?
   A. To let the water run away.
2. Q. What happens to the soil in the box without grass ?
   A. It gets washed away.
3. Q. What happens to the box containing soil with grass ?
   A. The soil does not get washed away.
4. Q. Why does it not get washed away by water ?
   A. Because the grass protects the soil.
5. Q. How does the grass protect the soil ?
   A. The roots bind the soil. The leaves cover the soil from falling rain.
6. Q Which soil would have less erosion by wind ? Why ?
   A. The soil covered with grass would have less wind erosion. The roots bind the soil.

Activity 5

How is soil protected by terraces ?

Aim of the activity

To show that sloping hill soil may be protected by building terraces These

are common in hilly areas.

Equipment

Two boxes, supply of stones, sand or soil.

Directions

As in the textbook.

Suggested questions

1. Q. What happens to the soil in the box without the terraces ?
   A. It gets washed away.
2. Q. What happens to the soil in the terraced box ?
   A. It mostly stays where it is.
3. Q. How does the terrace prevent the soil from being washed away ?
   A. It reduces the speed of the flowing water.
4. Q Where are terraces built ?
   A. In the hills.
5. Q. Why are terraces built in the hills ?
   A. Because the soil is easily washed off by running water on the mountain slopes.

Answers to questions in the textbook

1. (*a*) dark
   (*b*) plants
   (*c*) terraces
   (*d*) plains
   (*e*) bunds
2.

Column A	Column B
(*a*)	(*d*)
(*b*)	(*a*)
(*c*)	(*b*)
(*d*)	(*c*)

3 He should plough across. This would make some sort of terraces on the hill slope.

4 The roots of the tree bind the bund soil. The foliage protects the surface from direct rain.

Homework assistance

1. The children may be shown where to find different coloured soils in their localities. The teacher should make sure that the children do not dig in places where they may need permission.
2. The best time to conduct these investigations is when the fields are being ploughed or when the crop has been harvested. This will avoid damage to the crops.
3. The teacher may point out where the various protected areas may be found, so that the children may themselves find out the ways of protecting soil from erosion.

CHAPTER IV

Work, Energy and Machines

Children's Previous Experience

In Class 3 the children learned about the nature of a force and the various sources of force. They also learned about friction and the way by which friction may be reduced, such as by rollers, wheels and lubrication.

The importance of measurement was also emphasised and the children were taught how to measure area and temperature.

Overview of the Unit

The main emphasis of this chapter is on the concept of energy and its different sources. These energy sources are needed for doing work.

Work can be made easier by using machines of various kinds. Simple machines, like levers and ramps will be studied.

The concept of measurement has been extended to include volume and the concept of density has been introduced but not studied in depth.

The technical concept of "force" and "work" has not been included in the text. However, if the teachers feel that the pupils will understand these concepts, he may make use of the Teacher's Handbook of Activities—Vol II.

Treatment of Major Ideas

1. *Energy is needed to do work*

With the help of four activities it is illustrated that energy of different kinds makes work possible

2. *There are different sources of energy*

The same four activities are also used to illustrate the different sources of energy —mechanical, electrical, magnetic and heat.

3. *People use many simple machines to do work*

Activities are used to illustrate that simple machines such as ramp and lever make it easier to do work.

4. *People often need to measure volume*

The measurement of volume is introduced through a simple activity. The litre is used as a common unit of volume and the children are made familiar with its use in their daily life.

5. *The concept of density is useful to distinguish between different materials*

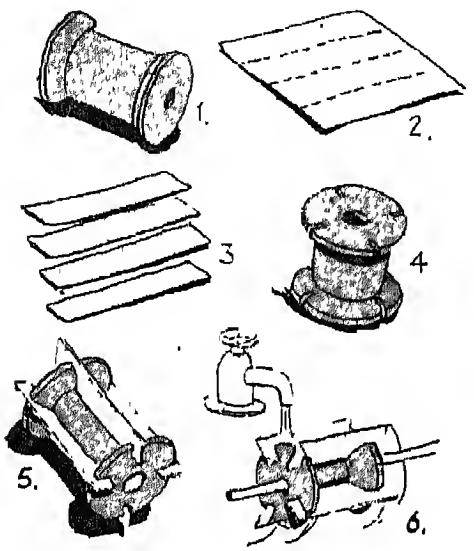
The idea of density is merely introduced because it is felt that the con-

cept is too difficult for children to understand in any detail.

DETAILS OF PUPILS' ACTIVITIES

Activity 1

How is the energy of falling water used to do work ?



Aim of the activity

The principal aim is to enable the children to discover that falling water has energy which can be used to do work.

The teacher should relate the activity to how a water mill or a water turbine works.

Equipment

Empty cotton reel, metal sheet, metal rod or nail, bucket, water.

Directions

Make the model water wheel as given in the text If a water tap is available then this may be used instead of a bucket.

In this case, the teacher may show the children that by increasing the flow of water, the speed of the water wheel may also be increased.

Suggested questions

1. Q What happened to the water wheel when water was poured over its blades ?
   A. The water wheel turned
2. Q. Why did the wheel turn ?
   A. Because the falling water made it turn.
3. Q. What is it in the falling water which caused the wheel to turn ?
   A. The energy (force may also be a correct answer at this level).
4. Q. Which kind of water has more energy—fast moving or slow moving ?
   A. Fast moving.
5. Q. Where is the energy of falling water used ?
   A. Water mill, hydro-electric power station.

The teacher may repeat this activity by asking the children to blow on to the wheel. This will enable them to understand that wind also has energy which can be used to do work. Similar questions may be asked.

Activity 2

How is the energy of steam used to do work ?

Aim of the activity

This activity is to help the children to discover that the moving steam has energy that can turn a 'water' wheel. The energy of steam is utilised to drive

engines. The activity also leads to the important idea—that heat is a source of energy. But this concept may be too difficult for the children of this age to understand.

Equipment

Water wheel, kettle of boiling water.

Directions

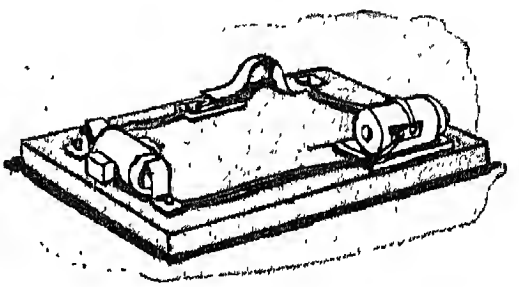
Fix the water wheel so that steam may blow against the blades. Care should be taken that the children do not scald their hands

Suggested questions

1. Q. Why does the steam make the water wheel turn ?
   A. Because the steam coming out has energy
2. Q. Where does the steam come from ?
   A. From boiling water.
3. Q. What makes the water boil ?
   A. Heat from the burner.
4. Q. Where does the energy really come from to turn the water wheel ?
   A. It comes from the heat of the flame.

Activity 3

How is the energy of electricity used to do work ?



Aim of the activity

This is to show that electricity may be used as an energy source for doing work.

Equipment

Electric motor, copper wire, battery, switch.

Directions

If enamelled wire is used, the wire will have to be scraped in order to complete the circuit.

If a simple switch board is available it could be used to give the children some idea of how a circuit works.

Suggested questions

1. Q. When does the motor start running ?
   A. When the current is turned on by switching.
2. Q. What happens when you turn off the switch ?

A. The motor does not turn.

3 Q. What causes the motor to turn ?

A. The electricity from the battery.

4. Q. Where does the energy come from ?

A. It comes from the battery.

5 Q What kind of energy does the battery supply ?

A. Electricity.

6. Q. Why does the motor stop ?

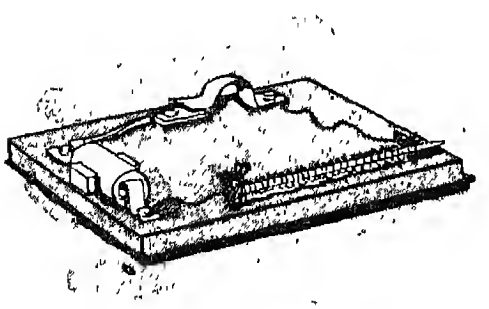
A. Because the flow of electricity is stopped by the switching off.

7. Q. Where does the electricity flow ?

A. It flows in the wire.

Activity 4

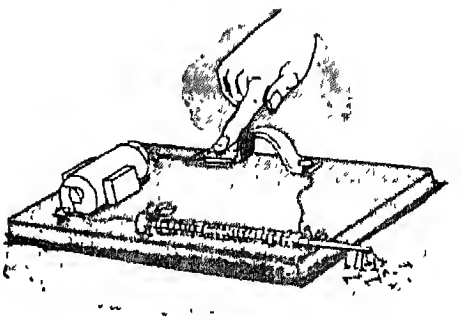
How is electricity used to make a magnet ?



Aim of the activity

The major aim is to show that electricity and magnetism are closely related. In Class 3 the children have learned about magnetic forces. The activity builds on this experience and associates electrical energy with magnetic energy.

It is possible that the concept may be too difficult for the children to understand, but at least it will give them a useful experience.



Equipment

Copper wire, battery, large nail, small nails, circuit board.

Directions

Follow the directions in the text and make certain that the insulated wire is made bare, otherwise the electricity will not flow.

Suggested questions

1. Q. Is the nail magnetised in the beginning ?

A. No.

2. Q How do you know that the nail becomes a magnet on passing electricity in the wire around it ?

A. Because it picks up iron nails.

3. Q. What happens to the nail when electricity flows in the wire around it ?

A. The nail becomes a magnet.

4. Q. What causes the nail to be magnetised ?

A. The electricity flowing in the wire.

5 Q What happens to the nail when the current is switched off ?

A. The nail ceases to be a magnet.

6. Q. Where does the magnetic energy come from ?
   A. It comes from electricity.
7. Q. What can this magnetic energy be used for ?
   A. It can lift loads.

Activity 5

Do we produce heat when we do some work ?

Aim of the activity

It is to show that when work is done, a part of it is changed into heat.

Equipment

Two pieces of stone.

Directions

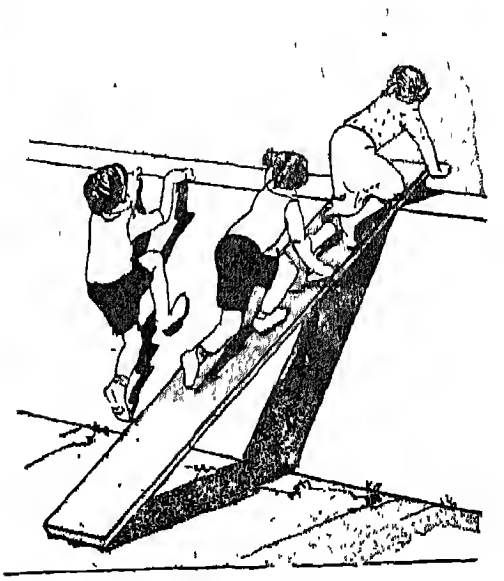
Let the children follow the directions given in the textbook.

Suggested questions

1. Q. What were you doing when you were rubbing your hands ?
   A. We were doing work.
2. Q. What were you doing when you were rubbing stones ?
   A. We were doing work.
3. Q. Did you find any change in your hands or stones ?
   A. Yes, they became warm.
4. Q. What energy makes things warm ?
   A. Heat
5. Q. Where did the hands or stones get heat from ?
   A. Some of the work changed into heat energy.

Activity 6

How does a simple machine help us to do work ?



Aim of the activity

The principal aim is to demonstrate a ramp as being a simple machine which makes our work easier.

Equipment

Wooden plank.

Directions

The teacher has to improvise a situation where a ramp may be used. If there is no boundary wall, the plank may have to be supported by a box or some other thing which the children will find difficult to climb.

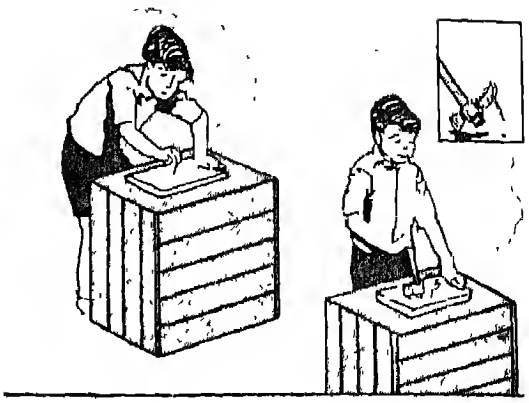
The important thing to emphasise is that the ramp assists the children to climb the wall. In other words it makes their work easier.

Suggested questions

1. Q. Can you climb the wall in one step ?
   A. No.
2. Q. How does the ramp help you to climb the wall ?
   A. It breaks the climb into several steps, and makes it easier to climb.
3. Q. What do we call a thing that makes our work easier ?
   A. We call it a machine.
4. Q. How else can a ramp help us to do work ?
   A. It helps us to carry loads up steep banks.
5. Q. Have we any ramps in our homes ?
   A. The ladder and the stair case are the kinds of ramp.

Activity 7

How do pliers help us to do work ?



Aim of the activity

The main aim is to show the children that a pair of pliers is a simple machine. The teacher may also mention that the claw hammer, scissors and nut-crackers are also simple machines which enable us to do work more easily.

Equipment

Hammer, pliers, nails, wooden board, pliers scissors and nutcrackers if available.

Directions

It may be wise for the teacher to hammr tehe nails into the board. The children may then try to pull them with bare hands and then by pliers.

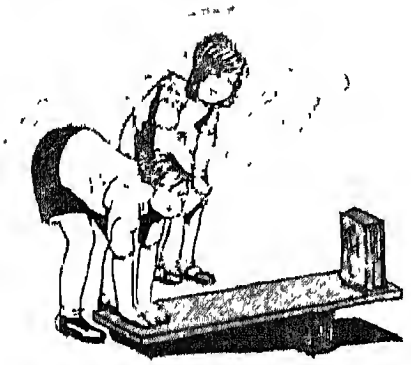
Suggested questions

1. Q. Can yon pull out the nails with your fingers ?
   A. No, it is too hard.
2. Q. Why do you find the nail difficult to pull ?
   A. It is hard to grip with your fingers.

3. Q. Is the nail easy to pull with pliers ?
   A Yes, it is easy to pull.
4. Q. Why is it easy to pull with pliers ?
   A. The situation is such that we can apply more force.
5. Q. What do we call something which makes our work easy ?
   A. A simple machine.

Activities 8 and 9

What is a lever ?



Aim of the activities

To enable the children to understand the operating principles of a simple lever. The activity should enable the children to get a better understanding of the previous activity.

Equipment

Short plank, two or three bricks, a small stone.

Directions

In making a plank work as a lever, select a small stone to act as fulcrum and a large brick as load. Keep the free end as long as possible.

Suggested questions

1. Q. Is the brick quite heavy to lift with your hand ?
   A. Yes.
2. Q. Is it easier to lift the brick with the help of the plank ?
   A. Yes, it is easier.
3. Q. Did the position of the stone below the plank make any difference ?
   A. Yes it makes a difference.
4. Q. When is the brick easiest to lift ?
   A. When the stone under the plank is closest to the rock to be lifted and the free end of the plank is the longest.
5. Q. What may be this plank and brick arrangement called ?
   A. It is a simple machine, a lever.

Extension of the ideas

1. This lever should be related to the operation of a balance, pliers, nutcrackers.
2. The teacher should impress on the children that levers are used in a wide variety of more complex machines.

Activity 10

What is volume ?

Aim of the activity

The object of this activity is to aquaint the children with the concept of volume.

Equipment

Empty bottle, measuring cylinder.

Directions

The capacity of the measuring cylinder provided will be less than that of the bottle. Therefore the children should be shown how to measure out the contents of the bottle into the cylinder. The teacher should see that the children do not spill any water

Suggested questions

1. Q. How many times did you fill the measuring cylinder from the bottle ?
   A. This may be 2-5 times depending on the capacity of the bottle.
2. Q. How much water does the cylinder hold up to the mark ?
   A. One tenth of a litre.
3. Q. What is the volume of water in the bottle ?
   A. (Depends on the size of the bottle)
4. Q. What is a litre ?
   A. It is a measure of volume.

Activity 11

How much is a litre ?

Aim of the activity

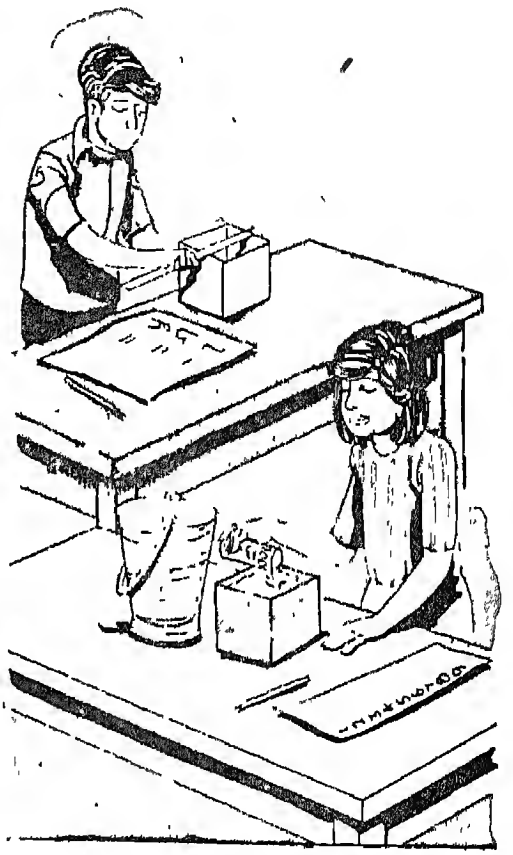
The aim of this activity is to give the idea that a litre is equal to 1000 cubic centimetres.

Equipment

A hollow cube of one litre capacity, measuring cylinder, scale.

Directions

The teacher should make certain that the children do not spill any water when they are measuring it out



Suggested questions

1. Q. How many measuring cylinders of water were there in the cube ?
   A. Ten.
2. Q. What is the volume of water in the cube ?
   A. One litre.
3. Q. What is the length of each side of the cube ?
   A. Each side is ten centimetres long

4. Q. When you multiply the length, height and breadth together, what do you get as the product ?
   A. 1000 cubic centimetres.
5. Q. How many cubic centimetres are there in a litre ?
   A. There are 1000 cubic centimetres in a litre.
6. Q. What is the capacity of the measuring cylinder ?
   A. One-tenth of a litre.

Extension of the idea

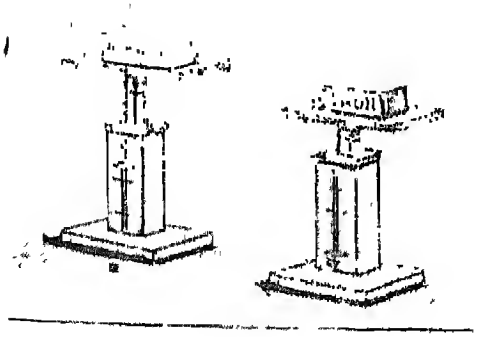
The teacher may ask the children to calculate the volumes of regular solids by measurement. For example, a thick book, chalk box, or pencil case, brick or blocks of wood.

Activity 12

Do solids of equal volume have equal weight ?

Aim of the activity

The aim is to show that equal volumes of different materials have different weight. The activity can form the basic experience for the introduction of the concept of density in higher classes.



Equipment

Top pan balance or spring balance, three or four blocks of different materials, for example, iron, wood, lead, and aluminium.

Suggested questions

1. Q. Are all the blocks of the same length and breadth ?
   A. Yes
2. Q. Do the blocks have the same thickness ?
   A. Yes.
3. Q. Are the blocks of equal volume ?
   A Yes.
4. Q. Are the blocks of equal weight ?
   A. No, some are heavier than others.
5. Q. Why is the block of iron heavier than the block of aluminium ?
   A. The block of iron is much denser than the block of aluminium.

Teaching note

The teacher will have to relate the idea of density to the different weights of the blocks of similar volume.

Answers to questions in the textbook

1. (*a*) energy
   (*b*) wind
   (*c*) magnetic
   (*d*) lever

2

Column A	Column B
(*a*)	(*c*)
(*b*)	(*a*)
(*c*)	(*d*)
(*d*)	(*b*)

Homework assistance

The teacher and parents will have to assist the children.

1. Tongs, nut cracker, pincer, hand pump.
2. Electric saw, electric fan, electric shaver
3. It is one litre.

CHAPTER V

Matter and Materials

Children's Previous Experience

In Class 3 the children learned about the three states of matter. They also learned that these are interchangeable. This interchangeability of matter was related to temperature which is regarded as the cause of physical change.

They also learned about the shapes of solids, liquids and gases.

Another important idea was that of solution. The effect of temperature on the solubility of substances in water was also dealt with.

Overview of the Unit

(*i*) The contrasting ideas of physical and chemical change are introduced through a number of simple activities in this chapter.

(*ii*) The particle nature of matter is introduced by inviting the children to see what happens when things are dissolved in water.

(*iii*) The idea of solutions is extended to include the solubility of gases in water.

Treatment of Major Ideas

1. *Heating and cooling produce important changes in materials*

Based on certain activities, the children discover the effect of heat on substances involving both physical and chemical changes.

2. *When a solid dissolves in a liquid it breaks down into tiny particles*

Two activities illustrate this idea, the stress being placed on the fact that there is space between particles of one substance which may be occupied by particles of another.

The first activity which deals with the solubility of a salt in water is supplimented by the second activity by using marbles and green gram as a concrete analogy. This will help the children to understand the phenomenon of a solution.

3. *Water can dissolve many gases*

This idea is illustrated by an activity which uses soda water as an example of a gas dissolved in water.

The idea is further extended by reference to the solubility of oxygen in water. This is of use to aquatic plants and animals.

DETAILS OF PUPILS' ACTIVITIES

Activity 1

Do all things change when they are heated ?

Aim of the activity

This activity contrasts a physical change with a chemical change.

Equipment

Wax, teaspoon, sugar, burner.

Directions

The teacher should keep a watchful eye on the children to prevent them from getting burnt.

Suggested questions

1. **Q.** What happens to wax when it is heated ?
   A. It melts.
2. **Q.** What happens when melted wax cools ?
   A. It becomes a solid again.
3. **Q.** What happens when sugar is heated ?
   A. It first melts, then goes brown and finally black.
4. **Q.** What happens when the heated sugar is cooled ?
   A. There is no change

(Give the children an idea of a physical and a chemical change)

5. **Q.** Which one of the above is a physical change ?
   A Melting of wax.
6. **Q.** Which examples of physical change have you seen ?
   A. Melting of ice and boiling of water to steam.
7. **Q.** Give an example of chemical change
   A Burning of paper, candle, etc.

Activity 2

What happens to potassium permanganate crystals when they dissolve in water ?

Aim of the activity

The aim is to show that when solids dissolve in water to form a solution, they break up into tiny particles which spread throughout the water.

Equipment

Beaker or glass jar,
potassium permangnate crystals.

Directions

Only one or two crystals of potassium permanganate should be used. Let the solution become uniform by itself.

Suggested questions

1. Q. What happens when the permanganate crystals are put in water ?
   A. Tiny, purple, smoke-like particles rise from the crystals.
2. Q. What happens to the size of the crystal ?
   A. It gets smaller.
3. Q Does the colour of the water change ?
   A. It turns purple.
4. Q. Does it take long for the water to change colour ?
   A. Yes, it takes some time.
5. Q. What happens finally to the crystal ?
   A. It disappears.

Activity 3

When solids dissolve in water, does the water level change ?

Aim of the activity

The aim is to show that when a salt dissolves in water there is very little difference in the water level. The idea of particles of solid in the spaces between iquid particles is suggested.

Equipment

Jar or tumbler, piece of sticky paper, salt, teaspoon.

Directions

The children should accurately mark the water level before and after the addition of the salt.

Suggested questions

1. Q. What happens to the water level when the salt is put in the water ?
   A. The water level rises.
2. Q. Why does the water level rise ?
   A. Because a solid is added to the water.
3. Q. What happens to the water level as the salt dissolves ?
   A. It goes down.
4. Q. Why does it go down ?
   A. Because the salt has dissolved.
5. Q. Where has the salt gone ?
   A. Into the water.
6. Q. Can the individual salt particles be seen when dissolved ?
   A. No.

Activity 4

What happens to the salt when it dissolves in water ?

Aim of the activity

It should be emphasised that this activity is only a concrete analogy of what happens when solutions are formed.

This is to show that when solids dissolve in water, the minute particles of solid occupy spaces between the particles of water. The terms atoms or molecules need not be used.

Equipment

Empty jam jar, 50 marbles, 200 grams of green gram.

Directions

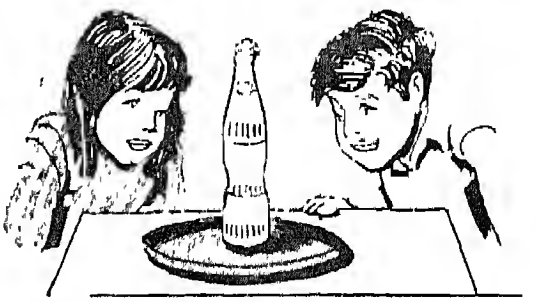
The children's attention should be drawn to the fact that at first the grams and marbles occupy distinct space in layers. Only on thorough shaking does the gram go into the spaces between the marbles.

Suggested questions

1. Q. When the gram and marbles were first put in the jar did they occupy different spaces ?
   A. Yes.
2. Q. Did the level of the contents change after shaking ?
   A. Yes, it went down.
3. Q. Why did the level change ?
   A. Because the gram goes into the space between the marbles.
4. Q. What do you think happens to the particles of salt when dissolved in water ?
   A. Like green gram and marbles they go into the spaces between the water particles.
5. Q. How small do you think the salt particles are when dissolved in water ?
   A. They must be very small because they cannot be seen at all.

Activity 5

How do we know that water dissolves gases ?



Aim of the activity

The aim is to let the children learn that gases may be dissolved in water.

Equipment

Bottle of soda water or any aerated water.

Directions

The activity here does not positively show that a gas is dissolved in water but the evidence shows that the gas must have remained dissolved, otherwise it cannot escape from the bottle. At this stage no further idea of solubility with temperature and pressure need be given.

Suggested questions

1. Q. What happens to the soda water when it is shaken ?
   A. Bubbles can be seen to rise from the water.
2. Q. Do you feel something pushing against your thumb ?
   A. Yes.

3. Q. What happens when you lift your thumb from the bottle ?
   A. The gas escapes with a hissing sound.
4. Q. From where did the gas come ?
   A. From the soda water.
5. Q. In what state was the gas present in soda water ?
   A. In a dissolved state.
6. Q. What other gases may be dissolved in water ?
   A. Oxygen and other gases in the air.

Activity 6

Are there gases dissolved in pond, stream and river water ?

Aim of the activity

This is to show that air is found dissolved in the water of ponds, streams and water supplies.

Equipment

Beaker, burner.

Directions

As given in the textbook. Care should be taken not to heat the water to boiling point.

Suggested questions

1. Q Can you see any bubbles before the water is warmed ?
   A. No.
2. Q. What do you see when you warm the water ?
   A. Bubbles come off the sides of the beaker.
3. Q. What are these bubbles ?
   A. Bubbles of air.
4. Q. Where did the bubbles come from ?
   A They were dissolved in the water.
5. Q. What gases do you think were in the bubbles ?
   A. Gases from the air.
6. Q. How are these gases useful to plants and animals ?
   A. Oxygen is breathed by plants and animals living in water.

Extension of the ideas

An additional worthwhile activity would be to boil some water and allow it to cool in an airtight container

Then take a jar of tap water and a jar of boiled water. Put some tadpoles in each one and put the tops on again.

The ones in the jar of boiled water appear to be restless

Answers to questions in the textbook

1. (*a*) ashes
   (*b*) chemical
   (*c*) melt
   (*d*) physical
   (*e*) a little
2.

Column A	Column B
(*a*)	(*d*)
(*b*)	(*a*)
(*c*)	(*b*)
(*d*)	(*c*)

CHAPTER VI

Housing and Clothing

Children's Previous Experience

The children have learned that there are many different kinds of houses. They also know that the climate has a great impact on the structure of houses from one part of India to the other.

Another important point is that houses should have proper sanitation and should be convenient and comfortable to live in.

Safety is another important factor which has been dealt with.

Overview of the Unit

The ideas about sanitation and healthy conditions of living are further extended to include the idea of good ventilation and cleanliness. Adequate light for rooms has also been stressed.

Another important point is that a variety of materials is used for building houses.

Clothes and shoes give protection from weather and disease. This idea is developed in the text.

The seasonal change of clothing is dealt with in an incidental way, but could be further emphasised by the teacher

The sources of the different natural and artificial fibres used for the weaving of the cloth are mentioned.

Treatment of Major Ideas

The textual material is mostly descriptive, because of the nature of the topic. This does not mean that the ideas in the chapter should be simply read. The teacher should make the work more interesting for the children by correlating the work with art and social studies.

For example, when the children deal with different kinds of housing and clothing that are found throughout India, the work could be closely integrated with social studies.

The major ideas dealt with in this unit are as follows :

1. *Clean, tidy, well aired and sanitary houses are essential for good health*

There are two activities dealing with the idea. They cover the basic principles of ventilation. The rest of the text is descriptive, emphasising certain features of good housing.

2. *A variety of materials are used for building houses*

This is purely descriptive but it is suggested that the teacher take the children out to see some of these materials on construction sites and builders lots.

A comparison of different kinds of houses would also be useful. Care should

be taken here to select representative samples available locally.

3. *Clothes and shoes give protection and appearance to people*

The emphasis is laid on clean, well cared for clothes. The teacher should reinforce the descriptive text by emphasising the importance of clean well cared for clothes and using ones own clothes to avoid infection.

During their art work the children could perhaps draw or paint pictures of the different kinds of clothes that are worn throughout India.

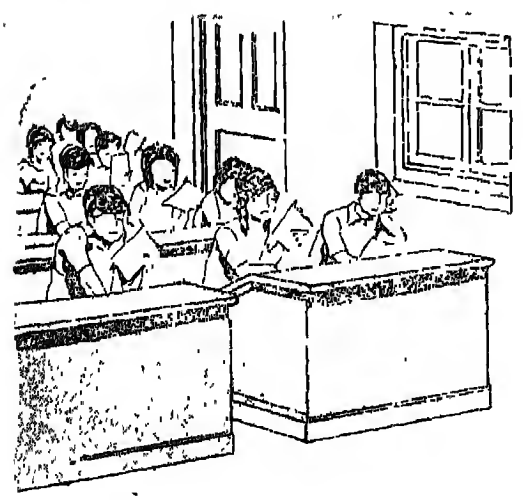
4. *Thread and yarn are made of natural and artificial fibres which are spun into cloth*

This is purely descriptive but it is suggested that the children can make mounted collections of different kinds of cloth. This work may be integrated with art or social studies.

DETAILS OF PUPILS' ACTIVITIES

Activity 1

Why do you feel hot and uncomfortable in a hot, stuffy room ?



Aim of the activity

The main aim is to show that a well ventilated room is more comfortable to live in

Directions

This activity would be more effective if taken during the hot season.

Suggested questions

1. Q. How do you feel when the doors and windows are closed ?

   A. We feel hot and uncomfortable.

2. Q. Why do you feel hot and uncomfortable ?

   A. Because the doors and windows are shut and there is no fresh air.

3. Q How do you feel when you open the doors and the windows ?

   A. We feel cooler and more comfortable

4. Q. Why do you feel cooler and more comfortable ?

   A. Because the room has fresh air.

5. Q. Why should you have doors and windows in the rooms of a house ?

   A. To get fresh air.

Activity 2

Where does the hot air go ?

Aim of the activity

The children should be able to discover the basic principles of ventilation. That is, hot air rises and cool air takes its place.

Equipment

Incense stick, matches.

Directions

The children should understand that the hot air containing the smoke from the incense stick rises up and is replaced by cool air.

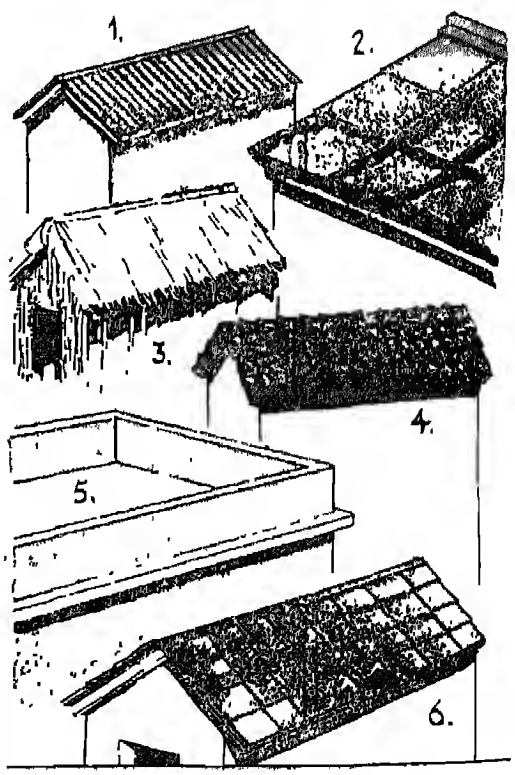
Suggested questions

1. Q. What happens to the incense stick when you light it ?
   A. It smoulders and smoke comes off it.
2. Q. What happens to the smoke ?
   A. The smoke rises.
3. Q. Why do you think that the smoke rises ?
   A. Because the hot air is rising
4. Q. Why does the smoke not go down ?
   A Because the warm air is lighter and carries the smoke up with it.
5. Q. How does the fresh air enter a room ?
   A. Through windows or doors.

Note. The teacher should point out that the stale hot air in a room rises and goes out from the top of the open windows. Cool, fresh air comes through the door or lower window and so ventilates the room.

Activity 3

What kind of materials are house roofs made of ?



Aim of the activity

The aim is to make children realize that the nature of a roof depends on the climate and the types of material available.

Equipment

Pictures of different kinds of roofs.

Directions

In the absence of good large size pictures of a variety of roofs, the pictures given in the book may be used.

Suggested questions

1. Q. How many types of roofs do you see ?
   A. As per picture.
2. Q. What are the different materials used in making roofs ?
   A. Let the pupils enumerate and describe them.
3. Q. Which of the roofs is most suited for an area with heavy rainfall ?
   A. Sloping roofs.
4. Q. What are the materials used in making such roofs ?
   A. Corrigated iron, asbestos, or thatch.
5. Q. Which roofs are most suited for a hot climate ?
   A. Flat or tiled.
6. Q. Why is a thatch roof very common in villages ?
   A. Because they are cheapest.

Activity 4

How are clothes made from thread ?

Aim of the activity

The aim of this activity is that the primary fibres like cotton, wool, silk etc. do not directly form cloth. They have first to be spun into threads and then woven into cloth.

Equipment

Samples of cloth pieces.

Directions

From the different cloth pieces children could tear apart threads and see how threads are arranged into a regular pattern of cloth.

Suggested questions

1. Q. From what fibre is cotton cloth made ?
   A. From cotton fibres.
2. Q. How is cloth made from the cotton fibre?

A. By spinning the fibre into thread and then weaving the thread into cloth.

3. Q. Why is it necessary to weave ?
   A. To keep the thread in position.
4. Q. From where is silk obtained ?
   A. From the silk worm cocoon
5. Q. From where is wool obtained ?
   A. From sheep's wool.
6. Q. What things are made from wool ?
   A. Woolen cloth, knitting yarn, blankets, carpets, and mats.
7. Q. Which fibres are artificial ?
   A. Nylon, rayon, terylene

Answers to questions in the textbook

1. (*a*) lighter
   (*b*) separate
   (*c*) wood
   (*d*) kept
   (*e*) spun

2.

Column A	Column B
(*a*)	(*c*)
(*b*)	(*d*)
(*c*)	(*a*)
(*d*)	(*b*)

Homework assistance

1. The teacher may take the children to the local weaver. The principles of weaving can be explained to the children.
2. This work may be done during the hand craft period.
3. The pupils may report to the teacher how they helped to make their house clean and tidy.

CHAPTER VII

Living Things

Children's Previous Experience

The children have learned about the characteristics of living things. They also know how to recognize the living from the non-living, and how plants and animals differ from each other

Overview of the Unit

The unit is structured around the idea that plants and animals interact with one another, and with their environments.

The idea of plant and animal communities has been developed Different habitats like pond, desert, mountains and wasteland have been used as examples to develop this idea.

The structural adaptations of plants and animals to the different habitats has not been dealt with in detail as this may be too long and difficult for children to understand.

Treatment of Major Ideas

Based on the approach of the community concept, the major ideas have been treated as follows :

1. *Plants and animals live in different kinds of surroundings*

   All of the activities for this chapter are based on field work The pond community has been selected as the most suitable one for a detailed treatment.

2. *Plants and animals are adapted to their surroundings*

   This has been covered while studying habitats of various plants and animals.

DETAILS OF PUPILS' ACTIVITIES

Activities 1 and 2

What kind of animals and plants live in a pond ?

Aim of the activity

The aim is for the children to find what kind of animals live in the pond.

Equipment

Hand net, empty jam jars for collecting, hand-lens.

Directions

All of these activities are best conducted just after the rainy season when the water is least likely to be polluted. Care must be taken to see that the pond you study is not polluted.

The pond selected for study should be shallow, not deep or dangerous. The teacher should give definite instructions as to how to collect the specimens from the water.

Suggested questions

1. Q. What are the different kinds of animals found in the pond ?
   A. Tadpoles, water beetles, water fleas, fish. (Additional animals may be identified according to local conditions.)
2. Q. How do these animals swim ?
   A. Fish swim with fins and tails. Tadpoles swim with their tails. Beetles swim with long paddle-like legs.
3. Q. What do these animals feed on ?
   A. (The children should see how the animals taken from the pond feed on one another and also on plants).
4. Q. How do these animals breathe in water ?
   A. They breathe air dissolved in water

Note. The pupils may be able to see the gill action of fish.

5. Q. How are these water animals different from those on dry land ?
   A. The pond animals have special paddles and tails to help them swim in water. Animals on land have legs or wings
6. Q. How many different kinds of plants can you find in the pond ?
   A. (Get the children to describe them. Reference to the plate on water plants would enable the children to identify them).
7. Q. How are these plants different from land plants ?
   A They have fleshy leaves and a soft stem. Few grow very large.
8. Q. What do you notice about the roots of free floating plants ?
   A. They are short.
9. Q. What do you notice about the root of anchored plants such as lotus ?
   A. They have a long root to anchor the plant.
10. Q What do you notice about the leaves of plants under the water ?
    A. They are much smaller and finely branched.
11. Q. How are leaves of floating plants (lotus and duckweed) different from plants that remain under water ?

A. The leaves of floating plants are much larger.

12. Q. How does this pond scum help the molluscs and other water animals ?
A. They form the food of these animals.

13. Q. Do water plants help the water animal in any other way ?
A. They supply them with oxygen.

14. Q. What is a pond food chain ?
A. Small water animals feed on green plants. Small water animals are eaten by small fishes. Big fishes and other animals feed on small fishes and other water plants.

Extension of the idea

The inter-dependence of plants and animals in a pond can be further extended by studying the inter-dependence of plants and animals in an aquarium.

Activities 3 and 4

What kinds of plants and animals live in dry waste land ?

Aim of the activity

The aim of this activity is to help children discover what is a waste land community.

Equipment

Hand-lens, and collecting jar.

Directions

The teacher should choose a suitable site beforehand.

Suggested questions

1. Q. What different kinds of plants do you find ?
A Grass, weeds, shrubs, small trees.

2. Q How do these plants differ from those of the pond ?
A They grow on land ; many of them have woody stems and thick leaves.

3. Q. Where do you find most of the small animals in this waste land ?
A. Under rocks, stones, logs of wood. Some animals like ants and termites live underground.

4. Q. What common birds do you see on waste land ?
A Crows, kites, mynahs, and sparrows.

5. Q. Are there any animal homes on the trees ?
A. Yes. (the children will name the birds nests that are there.)

6. Q. See if you can make up a food chain for this waste land.
A. Plants, caterpillar, mynah.

Extension of the idea

After this practical activity, the teacher may similarly extend the idea to a seashore community, a mountain community and a desert community. With the help of pictures and previous experiences of

children he may elicit from them why animals should have different food and different kinds of protective skins The idea of camouflage in animals to suit the environment may be developed. Brief descriptive accounts are given in the text.

Activity 5

In what sor of places do animals live ?

Aim of the activity

The aim of this activity is to enable the children to think about the habitat of different animals.

Equipment

Pictures of animals and their habitats.

Directions

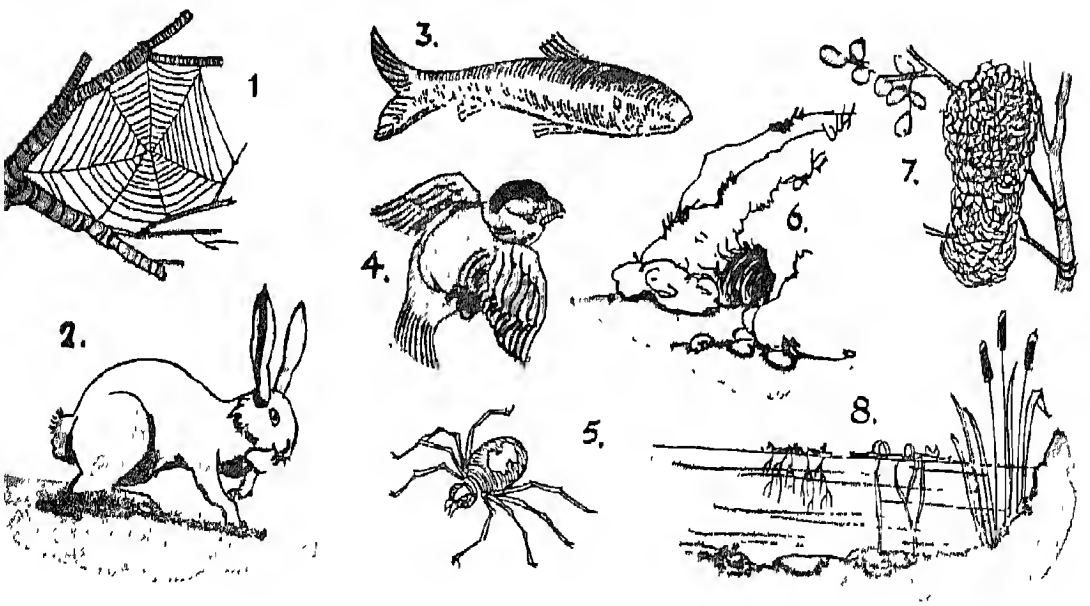
Some pictures are already provided in the textbook. The teacher may supplement with other pictures if these can be procured

Suggested questions

The teacher may select an individual animal and ask the children to locate its home. Then he may question as to why that home is suitable for that particular animal

Answers to questions in the textbook

1. (*a*) pond scum (*b*) millipedes
   (*c*) tide (*d*) cold
2. Column A Column B
   (*a*) (*d*)
   (*b*) (*c*)
   (*c*) (*a*)
   (*d*) (*b*)



Homework assistance

1 Assist the children in making scrap books or preserving collections.

2. & 3. Encourage the children to make independent observations and report.

CHAPTER VIII

Plant Life

Children's Previous Experience

The children have already learned about the different parts of plants and their functions. The fact that green plants can make their own food has also been introduced. The relationship of soil to plant growth is known. Another important idea is the need of seeds for growing new plants.

The following major ideas were covered in Class 3.

1. A plant has different parts.
2. Different parts of the plant have different functions.
3. Man often uses seeds to grow new plants.
4. Plants require soil suitable for their growth.

Overview of the Unit

One of the most important ideas in this unit is that green plants make their own food. The idea of dependence of animals upon green plants has been stressed in this unit. The role of the green plant as a primary producer of food has been emphasised. Special mention is made of the grass family as the main supplier of food for man and animals.

Man's dependence on plants and plant products is another important idea which has been introduced in this chapter.

It should be mentioned that the detailed process of photosynthesis has not been dealt with because it was thought to be too difficult for this age group. However a general description of the process has been given mentioning the roles of sunlight, water and carbon dioxide.

Treatment of Major Ideas

1. *Green plants make their own food from simple materials*

This is based on activities to show that sunlight and water are essential for plant growth. Plant growth has been emphasised rather than the manufacture of food by the plant. This is because the children have no knowledge of chemistry at this level.

The fact that non-green plants can not make their own food has been shown by simple activities.

2. *Grasses are the prime sources of food for man and animals*

Activities have been devised in the form of class visits to local farms to find out about the food of domestic animals.

3. *Plants are useful to man in many ways*

This section of the text is mainly descriptive but the teacher could well involve the class in discussion based on their experiences about the usefulness of plants to man.

For example, many plant products such as paper, pencils, clothes, tables, desks and chairs come from plants. This would be an excellent topic for class discussion.

DETAILS OF PUPILS' ACTIVITIES

Most of these activities are long term and the teacher should see that the children do the experiments properly and keep records. The teacher should explain that to study any factor regulating a process all but one should be controlled. The two plants taken should be of the same size and the same amount of soil in equal sized pots should be taken and only one of the factors like water or sunlight, etc., should be varied.

Activity 1

Is sunlight needed for plant growth ?

Aim of the activity

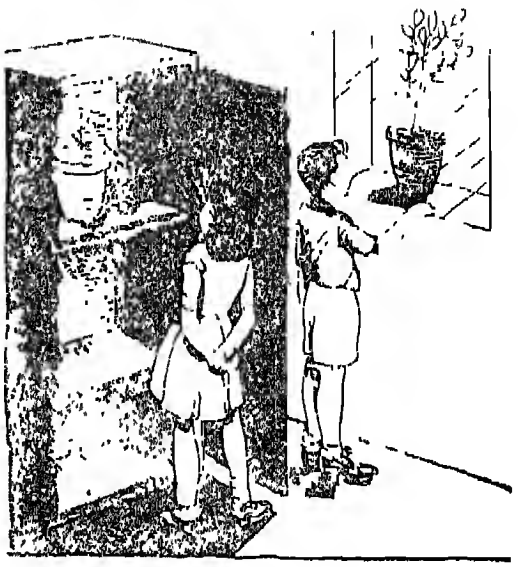
This is to show the role of sunlight in the growth of green plants. The activity would help in developing the skill of controlling variables in an experiment. The idea of growth should be related to the production of food by the plant, for without food the plant cannot grow.

Equipment

Two potted plants,
a dark cupboard.

Directions

It is essential to keep one of the plants in absolute darkness, otherwise the experiment will not work.



When the plants are watered, the one in the dark must not be exposed to light.

Suggested questions

1. Q. What difference do you observe between the two plants after a week ?
   A. One is green with healthy leaves. The other has thin and yellow leaves.
2. Q. Did the plants have similar soil and same quantities of water ?
   A Yes, they did.
3. Q. Did both plants have the same amount of sunlight ?
   A. No, the one in the cupboard had no sunlight.

4. Q. Why has the plant in the cupboard not grown well ?
   A. Because it has had no light.
5 Q. Is sunlight necessary for plant growth ?
   A. Yes, it is necessary.

Activity 2

Is water necessary for plant growth ?

Aim of the activity

This activity shows through controlled experimentation that water is essential for plant growth.

Equipment

Two healthy potted plants.

Directions

The teacher should see that the plants are correctly labelled and that one pot gets *no water at all.*

Suggested questions

1. Q. What difference do you observe in the two plants ?
   A. One plant has wilted and died.
2. Q. Did both plants have soil, sunlight and air ?
   A. Yes.
3 Q. Did both plants get the same amount of water ?
   A. No.
4. Q What caused one plant to die ?
   A. It had no water.
5. Q. Is water therefore needed for plant growth ?
   A Yes

Activity 3

Do all plants make their own food ?

Aim of the activity

This is to emphasise that only green plants are able to make their own food. Non-green plants depend for their food on the decaying matter of green plants.

Equipment

Toadstools and mushrooms,
two pots with soil,
some bean seedlings.

Directions

This activity should be taken during the rainy season when mushrooms and fungi are found easily.

Suggested questions

1. Q. What difference do you observe in the two plants after a week ?
   A. The toadstools did not grow.
2. Q. Did they both have sunlight, soil, water and air ?
   A. Yes, they did.
3. Q. What is the difference in the colour of the toadstools and beans ?
   A. Beans are green, toadstools brown.
4. Q. Why do the beans keep on growing ?
   A. They have all the things required for growth—sunlight, soil, air, water and green colouring matter.
5. Q. Why did the toadstools die ?
   A. The toadstools were not able to make their own food.
6. Q. Why can't toadstools make their own food ?
   A. They have no green colouring matter.

Activity 4

How do toadstools and other non-green plants get their food ?

Aim of the activity

This is to show that plants like toadstools and fungi depend on decaying animal and vegetable matter for food.

Equipment

Mouldy bread, decaying fruit.

Directions

The fungi should be moistened with a little water and preferably be kept in a dark corner. They should be looked after by the children.

Suggested questions

1. Q. What do you see growing on the stale bread ?
   A. Some white thread-like mould with black dots and green patches.
2. Q. What happens to the bread ?
   A. It seems to decompose and diminish in size.
3. Q. What happens to the fruit ?
   A. Blue-green patches grow on them. Fruit seems to become hollow and sometimes a foul smell comes out of it.
4. Q. Why do the fruit and the bread seem to be eaten away ?

A. Mould growing on it uses the food of the bread and the fruit.

5. Q How do moulds growing on decaying fruit and bread get their food?
   A. They get their food from the bread and fruits through fine thread like filaments.

Activity 5

Which plants form the main food of man?

Aim of the activity

The aim of this activity is to help the children discover that cereal which forms an important part of man's food comes from plants of the grass family.

Equipment

The seeds of rice, wheat, millet etc.

Directions

The major part of this activity is based on discussion concerning the grass-like appearance of the concerned plants.

Suggested questions

1. Q Where does flour come from?
   A. From crushed wheat seeds.
2. Q. Where does rice come from?
   A From the seeds of paddy.
3. Q. What do the plants of rice and wheat look like?
   A. They look like grasses
4. Q. What are cereals?
   A. Rice, wheat, millet oats, rye. They are used for food.
5. Q. Why is sugarcane a member of grass family?
   A. The stem and leaves resemble grasses

Activity 6

Do animals also use grass plants as their main source of food?

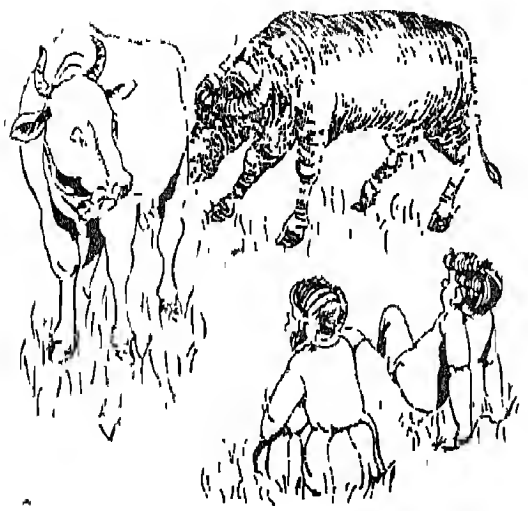
Aim of the activity

To make the children realise that grasses not only supply man with his main food but they are also the main food of animals.

Directions

This activity is again based on a field

trip when the children can observe animals feeding on the farm.



Suggested questions

1. Q. What do cows and buffaloes eat in the fields ?
   A. They eat grass.
2. Q. Do they eat other things too ?
   A. Yes, they eat the dry stems of rice, wheat and other cereals.
3. Q Do cows or buffaloes eat grass when they chew their cuds ?
   A. They eat grass that they have stored in their stomachs
4. Q. What other animals eat mainly grass ?
   A. Goats, sheep, deer, horses, donkeys, etc.

Answers to questions in the textbook

1. (*a*) food
   (*b*) energy
   (*c*) carbon dioxide
   (*d*) grass
2.

Column A	Column B
(*a*)	(*d*)
(*b*)	(*c*)
(*c*)	(*a*)
(*d*)	(*b*)

Homework assistance

No special assistance is required for this chapter.

CHAPTER IX

Animal Life

Children's Previons Experience

In Class 3, two major ideas were learned. The first was about the food eaten by different kinds of animals and the second was about the different ways of feeding.

Birds were dealt with in greater detail with regard to their food, feeding habits, adaptations and care for their young.

The major ideas covered were :

1. Animals require different types of food for proper growth.
2. Animals eat in different ways.
3. The bodies of birds are suited to flight.
4. Water birds are adapted for swimming or wading and flying.
5. The beaks and feet of birds are adapted to their feeding habits.
6. Birds have different nesting habits.
7. Birds care for their young.

Overview of the Unit

This chapter deals with the methods of reproduction in animals. What was learned about birds in Class 3 is extended to include other animals as well in Class 4—particularly how some animals care for their young and others do not.

Domestic animals need special care because they are looked after by man in return for their usefulness as beasts of burden.

Treatment of Major Ideas

1. *Animals reproduce their kind*

Reproduction in the mammal, birds, reptiles and insects is dealt with by observing their young ones by visits to farms.

2. *Some animals care for their young*

This major idea is treated along with the first idea-reproduction and care for young being taken together.

The children can observe how cats look after kittens, buffaloes look after calves and sparrows look after their young.

This is contrasted with the behaviour of frogs, fish, butterflies and other insects who do not care for their young ones.

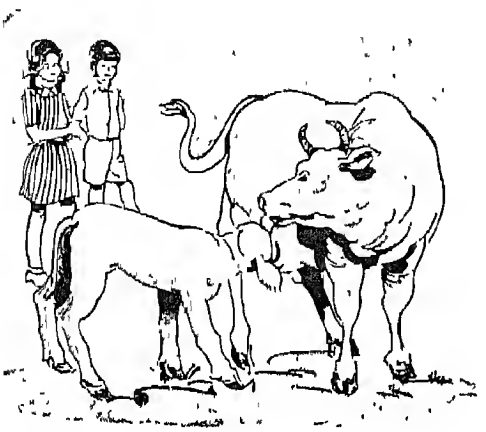
3. *Domestic animals need special care*

There is a brief description of man's responsibility towards his domestic animals at the end of the chapter.

DETAILS OF PUPILS' ACTIVITIES

Activity 1

Which animals give birth to living young.



Aim of the activity

The main aim is to show that mammals, including man, give birth to living young ones who resemble their parents.

Directions

If the teacher is unable to take his class to a farm, then perhaps pictures of animals and their young ones could be used.

The teacher could organize a discussion based on the pictures.

Suggested questions

1. Q. Does a calf look like its mother ?
   A. Yes.
2. Q. Where does the calf come from.
   A. The mother gives birth to it.
3. Q. How does the mother feed her young ?
   A. She suckles her young with her milk.
4. Q. What other animals give birth to living young ones ?
   A. Monkey, horse, man, donkey, cat, dog, sheep.
5. Q. Does the mother care for its young ?
   A. Yes.
6. Q. How does the mother care for its young ?
   *A It feeds and protects its young and even attacks those who try to approach the young ones.

Activity 2

Do all animals give birth to their young ?

Aim of the activity

This is to let the children find out that all animals do not give birth to young. Birds lay eggs and the eggs hatch out into young ones.

The children should also discover that hens and ducks look after their young.

Directions

The teacher should take his class to a nearby poultry farm. If possible the children should see newly laid eggs and a nearly hatched chick with the broken egg shell

Suggested questions

1. Q. Where does a hen egg come from ?
   A. It comes from inside the hen.
2. Q. Where does the chick come from ?
   A. It comes out from an egg.
3. Q. How does the chick come out of the egg ?
   A. The hen hatches it by sitting over it.
4. Q. Do the chicks look like their mother ?
   A. A little they are very small and have fluffy down.
5. Q. Do hens give birth to live young ?
   A. No, they lay eggs.
6. Q. Do all birds lay eggs ?
   A. Yes.
7. Q Does the hen care for its chicks ?
   A. Yes, she feeds them and protects them from others.

Activity 3

Do other animals lay eggs also ?

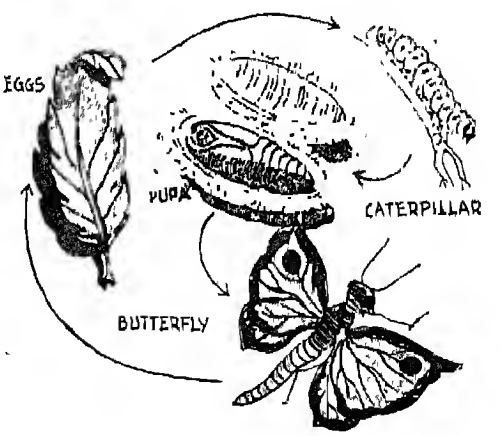
Aim of the activity

To let the children see that many animals lay eggs. Those eggs are often left to hatch and the parents take no further interest.

Equipment

Wide-mouthed bottle, insect collecting net.

Some insects like moths or butterflies.



Directions

The teacher should find out where butterfly eggs and caterpillars may be found. Then he can take his class there.

Suggested questions

1. Q. Do butterflies, (and other insects seen) lay eggs ?
   A. Yes, they do (only if they are seen laying eggs).
2. Q. Where do caterpillars come from ?
   A. Out of eggs laid by a butterfly.
3. Q. What does the caterpillar feed on ?
   A. (The children should find out).
4. Q What happens to the caterpillar ?
   A. It grows and changes into a pupa.
5. Q Does the pupa feed ?
   A. It does not feed.
6. Q. What happens to the pupa ?
   A. It changes inside into a butterfly and cuts the cocoon to come out.

Answers to questions in the textbook

1. (*a*) do not
   (*b*) suckle
   (*c*) caterpillars
   (*d*) pupae
2.

Column A	Column B
(*a*)	(*c*)
(*b*)	(*a*)
(*c*)	(*d*)
(*d*)	(*b*)

3. Children should be encouraged to do this themselves

Homework assistance

1. Check the lists prepared by the children.

2. Direct the children how to keep larva in bottles.

3. The teacher may have to assist the children by showing at what time of the year, and where they should look for eggs of frogs and toads.

They can bring them to the classroom and keep them in an aquarium.

CHAPTER X

Human Body, Health and Hygiene

Children's Previous Experience

By now the children have learned about the different functions of the body. Digestion, breathing and circulation of blood have been studied to show how the body functions as a single unit.

There has also been an emphasis on understanding the need for good breathing, eating and other personal habits.

The major ideas covered in Class 3 are as follows :

1. The human body works as a single unit.
2. Many organs are involved in a particular function of the body.
3. Nose, wind pipe and lungs are part of the breathing system.
4. Healthy breathing habits are essential.

Overview of the Unit

It is important that the teacher emphasises the need for good personal habits. Sound reasons for developing these habits should be put forward by the teacher to convince the children

The function of digestion and good eating habits is further developed by a series of activities which deal with the nutritional aspects of food. The emphasis is on the eating of raw vegetables and fruit in order to obtain a balanced diet.

The importance of the proper cooking of food so as to retain its food value is also emphasised.

The need for protecting food from contamination by flies and dust in particular, is something that teachers should stress at every opportunity.

Ways of keeping food are dealt with in the text to illustrate how food may be preserved in times of plenty for periods when it is scarce. Since at this age the children's permanent teeth begin to grow it is important for teachers to stress the need of proper care of their teeth.

Treatment of Major Ideas

1 *Some food is eaten raw and some cooked*

This section is purely descriptive and deals with the need for washing raw fruits and vegetables with safe water before they are eaten.

2. *Cooking improves the food in several ways*

This is dealt with through two activities, both dealing with the effective use of cooked food.

The rest of this section is in narrative form, emphasising that properly cooked food is easily digested.

3. *Care should be taken not to waste food while cooking*

This idea has been explained with an activity. The importance of utilising the water which is used for boiling vegetables is emphasised. Very often this water is rich in soluble salts Overcooking and faulty cooking of food can destroy the food value.

4. *Food needs to be protected from bacteria and mould, etc.*

This idea has been developed through an activity and narration The activity deals with how cooked food may be spoiled if kept for a long time. Even uncooked fruit and vegetables do not keep for a long time

6. *Food can be preserved for future use*

The fact that food does not keep for a long time is further extended here. The ways of keeping food for future use is dealt with in an activity which shows how low temperature preserves food. Methods of preserving food, like adding salt or sugar are given in narrative form. In both the above topics, the emphasis is only on the observed result rather than on the causes.

Teeth

1. *Good teeth are useful to man in many ways*

This is dealt with through activities which show that good teeth are necessary for chewing food and for clear speech.

2. *There are different types of teeth*

This is dealt with through an activity where the children examine their teeth in a mirror If this activity is combined with the one above, the children could see how different teeth act in different ways on the carrot they are chewing. The front teeth cut and the rear teeth chew and grind the carrot.

The teacher could ask the children to compare their own teeth with the teeth of the animals they studied in Class 3 with reference to their functions.

3 & 4 *Strong healthy teeth need proper cleaning and care*

The major ideas 3 and 4 under the section 'Teeth' of the syllabus are combined here as they are closely related to one another

These ideas are dealt with through two activities. One dealing with the care of the teeth and the other with tooth decay In cases where pupils are neglecting their teeth they should be drawn aside and advised on how to look after their teeth

Microbes

It is felt that this section of the syllabus is too difficult for the children of this age. As no microscopes are available for the primary school, there will be no practical basis for studying bacteria and fungi. A simple narrative account by the teacher will be helpful. Some diagrams or charts, if available, may be shown.

DETAILS OF PUPILS' ACTIVITIES

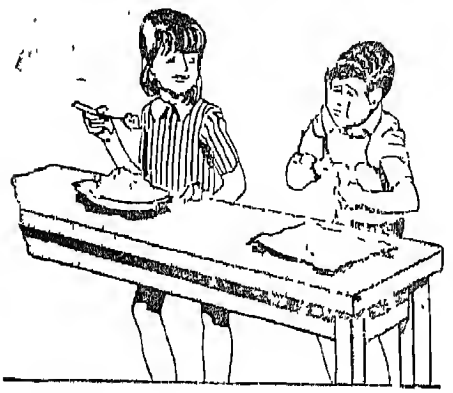
Activity 1

Why do we eat cooked food ?

Aim of the activity

This is to show children that food such

as rice and potato taste better when cooked than when they are uncooked. It may also be further explained that not only they taste better, but they are easier to digest.



Equipment

Some raw rice, potato or any other food which is normally eaten cooked, burner, a container suitable for cooking.

Directions

The teacher should make certain that the children only chew and do not swallow the uncooked food

Suggested questions

1. Q. What did the raw rice or potato taste like ?
   A. It did not taste very nice.
2. Q What did the cooked rice or potato taste like ?
   A. It tasted much better.
3. Q. Was the cooked rice easier to chew than the uncooked rice ?
   A Yes.
4. Q. Why was the cooked rice or potato easier to chew ?
   A Because the boiling softened the food.
5. Q Does the cooking of food affect your digestion.
   A Yes, it makes food easier to digest.

Activity 2

Why should we use the water used for cooking vegetables and not throw it away ?

Aim of the activity

This is to show that vegetables contain minerals which are good for health The teacher should emphasize that vegetable water of any kind may be used to make any soup base.

Equipment

As for Activity 1. Beans.

Directions

These are clearly given in the text.

Suggested questions

1. **Q.** What did the bean water look like ?
   A It was greenish in colour.
2. **Q.** Why was the water green ?
   A. The green colour came from the beans.
3. **Q.** Did the bean water taste different from the plain water ?
   A Yes.
4. **Q** Why did it taste different from plain water ?
   A. Because of the minerals that came out of the beans.
5. **Q** Can you now say why we should not throw away the water used for boiling vegetables ?
   A. Because it contains useful minerals for the body.

Activity 3

How does food spoil ?

Aim of the activity

This is to show that food spoils if it is kept for too long

Equipment

Do not throw away the boiled potatoes used in Activity 1. They can be used for this activity

Directions

If desired, other cooked food could be used.

Suggested questions

1. **Q.** Do the potatoes smell bad ?
   A. Yes, they smell bad.
2. **Q.** What do they look like ?
   A. They have something growing on them.
3. **Q.** What is growing on them ?
   A. (The children should describe what is growing on them).
4. **Q.** What is the name of these plants ?
   A. Moulds.
5. **Q.** Why do they grow on potato ?
   A. They get their food from the potato and spoil it.

Activity 4

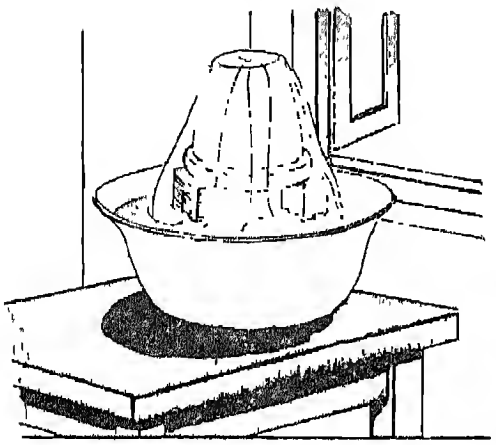
How can we make a food cooler ?

Aim of the activity

This is to show that the process of evaporation can be used to cool a food container. This enables the food to be kept for a longer period.

Equipment

A plastic dish, garden pot, bricks, large piece of cloth, thermometer.



Directions

The cooler should be put in a place where the evaporation rate is high. It should be left undisturbed for a time The activity should be correlated with home experiences when food is spoiled in summer.

Suggested questions

1. Q. Which food has the lowest temperature ?
   A. The food inside the garden pot.
2. Q. Why is the temperature much lower inside the pot than outside ?
   A. Because of the wet cloth.
3. Q. Why does the wet cloth cool the pot ?
   A Because the water in the wet cloth evaporates and cools it
4. Q. What happens to the food if kept in the cooler for a number of days.
   A It keeps fresh and cool.
5. Q. Why does the food keep better when it is cooled.
   A Low temperatures keep it from spoiling

Activity 5

Why is it necessary to have strong healthy teeth ?

Aim of the activity

This is to show that good strong teeth are essential to enable food to be chewed into small pieces. This enables the food to be thoroughly mixed with saliva which assists digestion.

Equipment

Raw carrot washed in safe water.

Directions

These are as given in the textbook.

Suggested questions

1. Q. Why must you wash the carrot with safe water ?
   A. To remove dust, germs and other contaminations.
2. Q. Do you eat the carrot as a whole ?
   A. No.
3. Q. How do you break it into small bits ?
   A. By chewing.
4. Q. What helps you to chew the carrot ?
   A. Teeth.
5. Q. How are good, healthy, strong teeth useful to you ?
   A. They help us to chew our food properly.

Activities 6 and 7

Do your teeth help you in any other ways ?

Aim of the activities

This is to show that teeth not only help in chewing food, but also assist in speaking properly and give correct structure to the face.

Equipment

None needed.

Directions

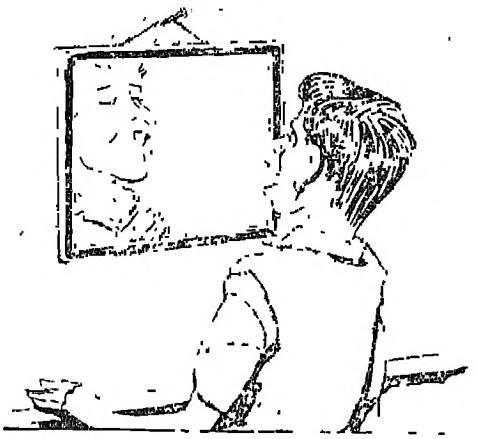
These are clear in the text. The teacher could correlate these with speech lessons.

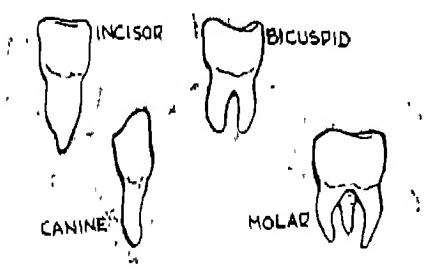
Suggested questions

1. Q How do teeth give appearance to a person ?
   A. They give proper structure to the face (and give a happy smile).
2. Q. Does your tongue touch your teeth every time you speak ?
   A. No, it only touches the teeth sometimes.
3. Q. Which words are difficult to say without touching the teeth ?
   A. (The teacher can work it out with the children)
4. Q. When you lost your first set of front teeth did you find it difficult to speak ?
   A. (Let the children give their difficulties. They may find it hard to pronounce certain sounds correctly).
5. Q. Why did you find it difficult to speak ?
   A. Because there were no teeth for the tongue to touch when speaking certain words.
6. Q. Did you have another tooth grow after the loss of your first tooth ?
   A Yes.

Activity 8

How many different types of teeth, do we have ?





Aim of the activity

The aim of this activity is to help the children find out that there are different types of teeth. Each kind has a different function like cutting, tearing and grinding.

Equipment

. None needed.

Directions

This activity could be combined with Activity 5. When the children are chewing carrots they could discover the uses of the different types of teeth.

Suggested questions

1 Q. When do you use your front teeth ?

A. We use them when we want to cut our food.

2. Q. What is the shape of your front teeth ?

A. They are sharp and wedge like for cutting food, such as carrots.

3 Q. What do you use your back teeth for ?

A. They are used for chewing and grinding.

4. Q. Are these teeth also sharp ?

A. No.

5. Q. Why are your back teeth useful for grinding up food ?

A. Because they are large and flat.

6. Q. Can you see any teeth which are different from those at the front and back ?

A There are four long pointed teeth, two on top and two on the bottom. (The teacher may explain that these teeth are similar to the long sharp teeth in dogs and cats. These are useful for tearing meat, etc., for these animals. In man this is not needed any more).

Activity 9

How do we care for our teeth ?

Aim of the activity

Care of the teeth is very important and the aim of this activity is to impress on the children the need for the proper care of the teeth.

It should be emphasized that if the children do not take care of their teeth they will decay and cause trouble.

Equipment

Neem twigs, tooth brush and tooth-paste or dental powder.

Directions

One of the children could demonstrate the correct use of a tooth brush. The neem twig is used for removing food from between the teeth and for brushing them.

The correct use of a tooth brush should be emphasised. A vertical movement dislodges particles between teeth and does not injure the gums. The massage of the gums is also important.

Suggested questions

1. Q In which part of your teeth does food remain after a meal ?

   A The food sticks between the teeth.

2. Q. What happens if you let this food remain between your teeth ?

   A. The food will be decayed by germs.

3 Q If the decayed food is left between the teeth what might happen ?

   A. The teeth may decay. Your breath will smell bad.

4. Q. What happens when teeth decay ?

   A. They cause pain and may have to be pulled out.

5. Q. If a decayed permanent tooth is pulled, will there grow another ?

   A. No. (The teacher should emphasise the importance of looking after teeth.)

Extension of the ideas

The teacher should point out that a permanent set of teeth grow only once in life time. Its health depends not only on proper care and attention but also on a balanced diet.

Plenty of raw vegetables and fruit should be eaten to supply the minerals required for the growth of teeth

These activities should be so organized that the cleanliness of teeth becomes a habit of the children. The teacher should periodically inspect to see that the teeth are really kept clean.

Answers to questions in the textbook

1. (*a*) food
   (*b*) cooked
   (*c*) easier
   (*d*) no.

2.

Column A	Column B
(*a*)	(*d*)
(*b*)	(*a*)
(*c*)	(*b*)
(*d*)	(*c*)

Homework assistance

The teacher may be able to assist the children find examples of animal teeth in the village.

He could perhaps use these for comparison with the children's own teeth.